ANNUAL REPORTS

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DEPARTMENT OF AGRICULTURE

FOR THE

FISCAL YEAR ENDED JUNE 30, 1897.

REPORT OF THE

SECRETARY OF AGRICULTURE.

MISCELLANEOUS REPORTS.

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REPORT

OF THE

SECRETARY OF AGRICULTURE.

TO THE PRESIDENT:

The Secretary of Agriculture has the honor to submit his annual report of the work of the Department for the fiscal year ending June 30, 1897.

OBJECTS OF THE DEPARTMENT.

The Department of Agriculture was organized to help farmers to a better knowledge of production and its tendencies at home and abroad, so as to enable them to intelligently meet the requirements of home and foreign markets for material that may be profitably grown or manufactured on American farms. It was also intended that the Department should organize a comprehensive system of means by which the sciences that relate to agriculture should become familiar as household words among our farmers.

SCOPE OF THE DEPARTMENT WORK.

The endowment of agricultural colleges by Congress in 1862 and the appropriations for experiment stations in 1887, for education in agriculture and for supplying correct information to farmers along the lines of their life work, are probably the most effective and far-reaching ever devised by the government of any people. Cultivators are becoming more familiar with the soils they manipulate and the climates of their respective localities, the plants adapted to their conditions, and the live stock that those conditions will best develop. The work done in each State along lines of agricultural investigation by experiment stations is to some extent local in its character, while much of it has general application. The Department of Agriculture designs giving wide circulation to everything of general interest, so that the farmers of all the States and Territories may get the benefit of good work done in each State.

ANIMAL PRODUCTS AND FOREIGN MARKETS.

The science of dairying is spreading from the agricultural college centers, resulting in greatly increased and improved production. The Department of Agriculture is seeking markets in foreign countries by making their people familiar with the superiority of our goods.

We produce meats of superior quality more cheaply than any other nation can put them on the world's market, owing to the cheapness of our grains and grasses. The State experiment stations are giving feeders information regarding the best methods of nutrition, which will result in more economic practices. The Department of Agriculture inspects live animals and dressed meats for export and certifies to their freedom from disease, supervises their condition through agents in foreign markets, and is the advocate of exporters where discriminations are laid upon the movement of live stock and meats in foreign countries. The Department will in the future endeavor to help producers to find markets for surplus productions, by getting and spreading information concerning them and concerning what foreign markets require.

EXPERIMENTS WITH SUGAR BEETS.

The Government spends money freely in distributing seeds and plants among the people. The policy of the Department of Agriculture in the future will be to encourage the introduction of what will enable our people to diversify their crops and keep at home money that is now sent abroad to buy what the United States should produce.

Seven tons of imported sugar-beet seeds were distributed last spring in 27 States, among 22,000 farmers, through the experiment stations of those States, to ascertain where the sweetest beets can be produced. Samples are now being analyzed at the experiment stations, and where they are not prepared to do the work the beets are forwarded to the laboratory of the Department at Washington. There is abundant encouragement to lead us to conclude that our country will within a few years produce what sugar it requires. The Department will collect all the facts regarding the work of this season and publish them for general distribution. The pioneer work will be pushed energetically during the next year.

OPPORTUNITIES FOR NEW INDUSTRIES.

The United States paid $382,000,000 the last fiscal year for sugar, [illegible]ides, fruits, wines, animals, rice, flax, hemp, cheese, wheat, barley, [illegible]eans, eggs, tea [illegible]tc., $6,000,000 for chicory, castor beans, lavender, [illegible] [illegible]oppy, sumac, etc., and $2,000,000 for bulbs, nearly [illegible]d be grown and prepared for use at home. The [illegible]rage the growing of these arti- [illegible] sending out Farmers' Bulle- [illegible] [illegible]ing them.

[illegible] [illegible] horses as cheaply as he can grow [illegible]table export trade in cattle, and [illegible] and profitable in horses.

The Department is gathering facts regarding our horse industry at home and the requirements of purchasers abroad, so that our farmers may learn what foreign buyers demand.

ADVANCE IN SEED DISTRIBUTION.

We are endeavoring to get information from foreign countries with which we compete in the markets of the world regarding crops and prices. We are also taking steps to ascertain what crops are grown on different thermal lines, so that seeds and plants may be intelligently brought to this country to assist in the diversification of our crops and add to their variety. Agents are sent into foreign countries to make selections suitable to our various latitudes. All this work is done at a disadvantage and at considerable expense, which limits seed and plant importation. A scientist has been appointed in the Department to have charge of seed and plant importation. He will correspond with American representatives abroad, with scientific associations, investigators, seed houses, and the like, so as to get information concerning plant life in different latitudes and along the life zones that control plant growth. The Department requires the history as regards soil, climate, and antecedents of every seed or plant it imports. This is very difficult to get in many cases. None of the countries of the Eastern Hemisphere have a corps of scientists in every locality as the United States has. Our country has profited by introducing new seeds and plants, but much of this work has been done in the dark.

NEED OF QUALIFIED AGENTS IN FOREIGN COUNTRIES.

There is a necessity in every foreign country to which we send representatives for American agents who have been educated in the sciences relating to agriculture. The agricultural colleges endowed by Congress are educating men along these lines. Such men can now be had who are competent to report intelligently on the productions of countries where man has lived by tilling the soil for thousands of years, and they could keep the farmers of the United States informed regarding crops, markets, and their tendencies much more accurately than agents not scientifically educated.

GRASSES AND FORAGE PLANTS.

Much of our country is comparatively new; few of our native grasses or legumes thrive in connection with systems of rotation that are necessary to maintain fertility. They are fast disappearing as grazing and cultivation are adopted. It is a task worthy a nation's effort to replace them with grasses that form sod and replenish the soil with humus or legumes that fix free nitrogen in the soil and that provide the most valuable part of animal food. Both considerations demand the attention of the Department of Agriculture, and efforts

have been made during the past season to procure suitable grasses and legumes from the semiarid countries of Asia, through agents of the Department, for trial in the Western and Southwestern sections of our country.

THE DEPARTMENT SCIENTISTS AND THEIR WORK.

The Department has a thoroughly competent corps of scientists occupying places in the front ranks of their specialties, conducting research into all fields of inquiry where practical farmers need their help. They cooperate with the scientists of the several experiment stations in investigations of more than local interest, and keep in touch with observers and experimenters throughout the United States and in foreign countries. Reports of their work are distributed as the secrets of nature influencing agricultural production are revealed.

THE WORLD'S MARKETS FOR FARMERS.

The markets of the world are now in close, sympathetic touch. Their sources of supply are affected by the weather, by insect depredations, by military commotions, by transportation facilities, and by the intelligence of producers. The Department of Agriculture intends, through its bureaus, offices, and divisions, to carry information to the home of every farmer, and thus enable him to direct his efforts intelligently as changing conditions suggest.

EXPERIMENTAL EXPORTS OF BUTTER.

Early in the year it became apparent that a considerable surplus of butter of the higher grades would appear in our domestic markets. This had never before occurred, and it was plain that if such a condition prevailed for any length of time the price of fine butter would decline; and should this happen with the best quality, values would be depressed through all grades of this commodity. Before midsummer the best of creamery butter was offered in almost unlimited quantities in our largest markets at a price lower than ever known (14 and 15 cents) and no material change occurred for several weeks. I therefore decided to make a series of experimental exports of fine American butter, for the purpose of promoting an increased foreign demand for this article, and in order to get more exact information as to facts and conditions attending such exports than was otherwise obtainable.

GROWTH AND CONDITION OF OUR BUTTER TRADE ABROAD.

The export of butter from this country is nothing new. It began even as early as the year 1747, and exceeded 1,000,000 pounds annually a hundred years ago. Then it increased to 35,000,000 pounds in 1863, and, dropping to 2,000,000 in 1870, rose to almost 40,000,000

in 1880. Since that time the quantity exported has been as low as 5,000,000 pounds a year (1894) and as high as 31,000,000, the latter for the fiscal year ending June 30, 1897. New York City reports, for the commercial years ending with May, butter exports of 643,000 packages (about 60 pounds each) for 1880, 292,000 for 1890, 24,000 for 1895, 199,000 for 1896, and 320,000 for 1897. Since May 1, 1897, the exports from New York have been about 12 per cent greater than for the same months in 1896; but prior to the last year or two the butter exported was of low grade as a rule, and made not so much with a view to establishing a regular trade as to take advantage of special and transient conditions of the markets at home and abroad, and to make profits on these occasional business ventures. The result has been to give foreign merchants, especially in Great Britain, the impression that the butter of this country was poor in quality, and that no regular supply could be depended upon.

TESTING THE LONDON BUTTER MARKET.

Shipments of butter were therefore begun early in the season, under the supervision of the Dairy Division, and have since been continued at intervals of three or four weeks. The butter has been obtained from selected creameries in the leading dairy States, prepared with special reference to the ascertained requirements of foreign buyers, and thus far all has been consigned to a representative of the Department at London. It has been disposed of under his supervision, special efforts being made to test the demands of the London market and obtain the opinions of wholesale dealers, tradesmen, and consumers as to the merits of the butter thus sold and its relative position, present and prospective, in that market.

IMPROVEMENTS IN TRANSPORTATION OF BUTTER.

Much attention has also been given to the matter of transportation, with a view to shortening the time, improving the accommodations, and avoiding detentions and exposures, so as to make the conditions as nearly perfect as possible all along the line, from the producer, perhaps in our far West, to the consumer in England or on the Continent of Europe. It was at first found that although satisfactory facilities were provided by refrigerator cars and quick transit while on the rail, and by cold compartments on the steamships while at sea, there were points of necessary transfer where delays occurred, with the butter often exposed to high temperatures and the packages marred and injured by careless handling. Serious detentions at interior points of transfer and hours of needless exposure upon platforms and in terminal sheds at New York and other points have been located and arrangements made for preventing them. The railroads of this country and the special transportation lines operating over them appreciate the necessities of the case, and are prepared to perfect their

arrangements for receiving butter in all the large producing districts and delivering it unimpaired to vessels at any suitable port to any extent demanded by the development of this traffic.

COLD STORAGE OF BUTTER ON STEAMERS.

Suitable accommodations for cold storage of butter on ocean steamers were very imperfect and uncertain prior to the present year, and are not yet satisfactory at all points. But refrigerators have been available at New York almost every week during this season, and it is now evident that the demands of trade in this respect will be met sufficiently at that point and promptly provided for at other ports on the Atlantic and also on the Gulf. (These important provisions will apply as well to other perishable farm products, and encourage the extension of markets in that direction also.) At English ports there has been much complaint of detention and careless handling. An agent of the Department has given particular attention to this subject at Southampton, and reports the conditions there as much improved. A good deal remains to be done, however, to secure satisfactory facilities for transfer and prompt forwarding of butter and similar merchandise at those ports and proper accommodations on the freight trains to the interior markets of Great Britain. Refrigerator cars, such as are in common use all over this country, are as yet practically unknown in England.

BETTER REPUTATION FOR AMERICAN BUTTER.

The shipments made have served the double purpose of securing useful information for those of our own people, whether producers or dealers, who wish to sell abroad, and of aiding to establish a better reputation for butter from the United States among prospective customers. Leading English merchants have been thus convinced, as never before, of the excellence of butter obtainable in this country and the feasibility of delivering it fresh and unimpaired to British buyers.

In the endeavor to have all the butter included in these trials plainly marked and made known as the product of the United States, and thus presented to the English consumer, extraordinary prejudice has been met in London at every point. Merchants insisted that no good butter could come from America, made various unjust and absurd [illegible] the butter offered them, and even when convinced of its [illegible] their will, they offered to pay much less for it than [illegible] of no better quality from other countries and [illegible] once in the hands of the trade, our butter was [illegible] ish, Canadian, or Australian, and special efforts [illegible] way of [illegible] the hands of consumers, under its [illegible] commercial channels.

FACTS ABOUT AMERICAN BUTTER.

It is too early now to formulate all the lessons taught by these experimental exports, but certain facts have been already determined. Butter from the most remote creamery districts of the United States, when properly made, can be so transported as to be delivered in prime condition to consumers in England or on the Continent of Europe fifteen or twenty days after making. The quality of selected American butter is quite equal to the best offered in London from any other country, although our supply, as a whole, is not so uniform in character as that from some other sources, notably Denmark. Despite allegations to the contrary, the butter exported by the Department has been proved to contain less water and a greater proportion of pure butter fat than any butter for sale in the London market.

The products of the United States and of Denmark have been found to be the only absolutely pure butter imported into England; all others, including the product of British colonies, contain more or less injurious ingredients, used as preservatives. Notwithstanding the prejudices of London merchants, and the maintenance of comparatively low quotations for "States" butter, the creamery product of this country is now commonly retailed at the highest market price, on a perfect equality with the best English, Danish, and French butters. And English customers are so well pleased that, whether knowing it to be American butter or not, they frequently make special efforts to get more of that particular kind, and are disappointed on finding the supply to be insufficient and uncertain. The retail price obtained for butter exported by the Department during the summer has been from 24 to 28 cents per pound.

BUTTER PACKAGES FOR THE LONDON MARKET.

The London market objects to salted butter in small packages. There are indications that with some effort print butter and small packages for family trade might be successfully introduced, especially in the suburbs of the city. But consumers, as a rule, buy in small quantities, often daily, and prefer to see the quantity they want cut from a large body, like the contents of a box or tub, weighing 50 pounds or more. For this reason mainly the retailers, and consequently the larger merchants, demand large packages, and decidedly favor, because of convenience, the cubical box of 56 pounds, or a half hundredweight, known as the Australian package. Nevertheless, butter of established reputation sells in London, as elsewhere, at the best market rates, with little regard to the form of package. The best Danish butter, which still holds first place in English markets, is always found in kegs or firkins of different and irregular sizes. And although when the Department sent over early in the season exactly the same butter in boxes and tubs, the former sold for a cent or two

more per pound than the latter, subsequently, upon recognition of the quality of the article, the offerings made by the Department, in boxes and tubs, sold at the same price.

COLOR AND FLAVOR OF BUTTER.

English markets seem to differ as much as those in America in the matter of taste as to the degree of color and salt in butter. It is an easy matter to provide for meeting the requirements of any locality or market in these respects. At present London buyers want butter of a light lemon or straw color, even less yellow than our natural June grass butter, and lightly salted, having, in the finished product, about one-third of an ounce to the pound, or 2 per cent, of salt. A mild and even flat flavor seems to be preferred to the quicker and more decided flavors so highly esteemed in this country.

CONDITIONS AFFECTING EXPORTS OF BUTTER.

From the present outlook, the whole matter of future foreign markets for American butter depends upon the question of price. English merchants are rapidly learning, and those of other countries can be similarly taught, that they can get all the butter they want from the United States, and of a quality unsurpassed, if they will pay enough for it. But the supply of fine butter in this country is irregular in quantity and our home demand fluctuates, so that the highest grades are at times obtainable at prices which offer a tempting margin for export, and a few months later the same grade of butter sells for about as much in Chicago and New York as it would in London. While these uncertain conditions exist, no regular export trade of importance is likely to be established. Neither merchants nor consumers like change of kind in their supply of butter. A reliable supply of uniform quality is an essential condition to a regular trade. It costs 2 or 3 cents a pound, and sometimes more, to carry butter from an American creamery and sell it in Liverpool or London.

A comparison of market quotations in England and the United States month by month will show that at times there are strong nducements for exporting butter and none at all at other times. In ...ly last the wholesale price of t[illegible] best creamery butter in New York ...5 cents, while at [illegible] ...ter of equal quality was worth [illegible] ...nts i[illegible] the present writing but- [illegible] ...s country, while in [illegible] ...nly 20 per cent.

[illegible]

[illegible] ...ge to contract the [illegible] ...ixed price for the [illegible] temporarily else- [illegible] ...erage is satisfactory.

Others, including creamerymen as well as dairymen, are quite contented to follow the regular market price if their customer will take the entire product, week by week. From the investigations already made, it is evident that American creameries which do not find a sufficiently regular and satisfactory market for their butter product throughout the year, but are willing to accept ruling market prices, can arrange for disposing of their entire output to foreign merchants on terms quite as advantageous as those obtainable in this country.

FURTHER EXPERIMENTAL EXPORTS OF BUTTER DESIRABLE.

As already stated, the trials made the present season have been confined to the London market. The results obtained thus far seem to make it desirable to continue these experimental exports of butter enlarging the field of operations to include other points in Great Britain, which present peculiar local features, as well as selected markets on the Continent of Europe.

It may become expedient to make similar efforts to extend the markets for other perishable commodities, the products of American farms, such as poultry, eggs, and fruit.

THE PROBLEM OF THE FARMER'S HOME.

Among the educational movements which in recent years have engaged the attention of the public none has been received with greater favor than the attempt to introduce into schools for girls and women some systematic teaching of the arts which are practiced in the home. Many of the colleges of agriculture and mechanic arts, together with scientific, technical, and industrial schools, now maintain a department of domestic science. Cooking and sewing are quite commonly taught in the public schools, and cooking schools for women have been organized in numerous places. While useful instruction in these lines is imparted, it is generally recognized that much remains to be done before the teaching of domestic science can assume its most effective form.

NEED OF THOROUGH HOME TRAINING.

In this, as in other branches of instruction which have a vital relation to the arts and industries, the student should learn not only the best methods of doing the things required by the daily needs of home life, but also the reasons why certain things are to be done and others avoided. In other words, this teaching needs a scientific basis if it is to be thoroughly useful. In this respect domestic science is in the same category with medicine, engineering, and agriculture. It is not so very long ago that medicine and engineering were very largely empirical arts, and the schools of medicine and engineering were principally engaged in teaching men the things they were to do when

they became doctors or engineers. To-day no doctor or engineer is considered fitted to pursue his profession until he has drunk deep at the fountains of science and knows well the principles on which successful practice must be based. In agriculture it is coming to be clearly seen that teaching the boy how to plow or to perform any other farm operation is not the most important service which the school can render. There must be added to this definite and careful instruction in the principles on which agricultural practice is based. The farmer must be taught to think in the lines where science has shed light upon his art if his practice is to be most thoroughly successful. Fortunately, science has already much to tell the farmer which is most useful to him, and every year sees an increase in the great store from which the agricultural student can safely draw.

THE TEACHING OF DOMESTIC SCIENCE.

Now, what has been done for the boy in agriculture and engineering needs to be done for the girl in domestic art and science. And already the beginnings of a far-reaching effort in this direction have been made. The teachers of domestic science are not content to follow a dull routine of household drudgery in their teaching. They are appealing to the scientist and specialist in lines which touch the home life to explain the principles on which home practices should rest and to show them how intelligent taste and skill can make the home a pleasant place to live in, and how scientific knowledge can enable the home keeper to maintain the health and generally promote the physical well being of those committed to her charge. Some progress has been made in formulating the replies which science is now able to give to inquiries relating to domestic science and in undertaking investigations with a view to greatly broadening our knowledge of these matters in the days to come.

THE DEPARTMENT'S WORK FOR THE HOME.

In the great work of helping the women of our land, nearly half of whom are toiling in the homes upon our farms, this Department, it is believed, has a large duty to perform. For, whatever will be effective in raising the grade of the home life on the farm, in securing the better nurishment of the farmer's family, and in surrounding them with the [illegible]ments and attractions of a well-ordered home, will powerfully [illegible]ite ali[illegible] to the material prosperity of the country and the [illegible] the farmers. The investigations which the Depart[illegible] [illegible]ten on the food and nutrition of man have already [illegible]ice to the teach[illegible] and students of domestic sci[illegible] the [illegible]vigations will hereafter be still [illegible] [illegible]ntific basis for the teaching and [illegible] through its close relations with the

agricultural colleges and other institutions for industrial training of the youth, the Department may incidentally aid the movement to educate women in the rational practice of the arts of the home.

PROPOSED HELP IN THE TRAINING OF WOMEN.

But beyond this it is much to be desired that the Department may be afforded an opportunity to undertake some definite enterprises which will enable it to extend much more material assistance to those who are engaged in the noble task of giving practical training to the future wives and mothers of our farmers and to that vast army of faithful women who are bearing the heavy burdens of keeping the farmers' homes pure and sweet and rearing the future masters of our vast agricultural domain.

BUREAU OF ANIMAL INDUSTRY.

MEAT INSPECTION.

The appropriation at the disposal of the Bureau has not been sufficient to enable it to inspect all the animals slaughtered in the United States designed for interstate and foreign commerce. The force engaged in this work has been enlarged from time to time, and the number of animals inspected has increased each year. During the past year all the beef exported to Europe, and a great part of the pork and other meat products, have been inspected in accordance with the law, but the Bureau has found it impossible to inspect the large amount of meat slaughtered for interstate trade. The force now used in the inspection is competent and efficient, and it should be extended sufficiently to meet the intent of the law looking to the inspection of all the meat entering into interstate and foreign trade. The persons obtained by certification from the eligible list of the civil service, as a rule, have been more competent and efficient than those obtained before the force was brought within the classified service.

The work of inspection was in operation at 128 abattoirs and packing houses located in 33 cities.

The following table shows the number of ante-mortem inspections made in the stock yards and at abattoirs, with the number condemned:

Ante-mortem inspection.

Animals.	For official abattoirs in cities where the inspection was made.	For abattoirs in other cities and miscellaneous buyers.	Total inspections.	Condemned at abattoirs.	Rejected in stock yards.
Cattle	4,289,058	3,960,967	8,250,025	195	24,951
Sheep	5,179,643	2,864,712	8,044,355	757	10,503
Calves	259,930	189,053	448,983	56	2,597
Hogs	16,813,181	8,753,563	25,566,744	12,858	40,287
Total	26,541,812	15,768,295	42,310,107	13,866	78,338

The following table shows the number of post-mortem inspections, giving the number of animals rejected, with the number of carcasses and parts condemned as unfit for human food:

Post-mortem inspection.

Animals.	Number of inspections.			Carcasses condemned.			Parts of carcasses condemned at abattoirs.
	At abattoirs.	On animals rejected in stock yards.	Total.	At abattoirs.	Stock-yard inspections.	Total.	
Cattle	4,242,216	11,634	4,253,850	6,618	3,725	10,343	10,290
Sheep	5,209,161	4,733	5,213,894	3,086	1,652	4,738	1,213
Calves	273,124	787	273,911	238	311	549	42
Hogs	16,808,771	30,263	16,839,034	a41,562	12,929	54,491	b37,750
Total	26,533,272	47,417	26,580,689	51,504	18,617	70,121	49,295

a Includes 3,243 condemned on microscopic examination.
b Includes 10,082 condemned on microscopic examination.

The meat-inspection tags or some other mark of identification were affixed to 14,510,662 quarters and 863,248 pieces of beef, 5,161,927 carcasses of sheep, 231,879 of calves, 524,556 of hogs, and to 314,947 sacks and pieces of pork.

The following table shows the number of animals inspected before slaughter, for abattoirs having inspection, from 1891 to 1897, inclusive:

Animals inspected for abattoirs having inspection, fiscal years 1891–1897.

Fiscal year.	Cattle.	Calves.	Sheep.	Hogs.	Total.
1891	83,891				83,891
1892	3,167,009	59,089	583,361		3,809,459
1893	3,922,174	92,947	870,512		4,885,633
1894	3,862,111	96,331	1,020,764	7,964,850	12,944,056
1895	3,752,111	109,941	1,344,031	13,576,917	18,783,000
1896	4,050,011	213,575	4,710,190	14,301,963	23,275,739
1897	4,289,058	259,930	5,179,643	16,813,181	26,541,812

MICROSCOPIC INSPECTION OF PORK.

In the microscopic inspection for trichinæ, 1,881,309 specimens were examined. The number of samples found infected was 13,325, of which 3,243 were from carcasses and 10,082 from pieces of pork.

The number of pounds exported was 43,572,355, of which only 001,783 pounds went to countries not requiring a certificate of microscopic inspection.

[illegible] years 1892–1897.

	To countries requiring inspection.	To countries not requiring inspection.	Total.
	Pounds.	*Pounds.*	*Pounds.*
[illegible]	22,025,698	16,127,176	38,152,874
[illegible]	8,059,758	12,617,652	20,677,410
[illegible]	18,845,119	16,592,818	35,437,937
[illegible]	39,355,230	5,739,368	45,094,598
[illegible]	21,497,321	1,403,559	22,900,880
[illegible]	42,570,572	1,001,783	43,572,355

The cost of this inspection was $111,669.30, an average per specimen examined of 5.94 cents, or an average of 0.256 cent for each pound of microscopically examined meat exported.

INSPECTION OF VESSELS AND EXPORT ANIMALS.

The number of inspections of domestic cattle for export was 845,116; number tagged, 410,379; number rejected, 1,565; number of inspections of domestic sheep, 348,108; number rejected, 189. The number of Canadian cattle inspected was 13,136; number rejected, 12; Canadian sheep inspected, 23,289; number rejected, 72.

The number of domestic animals exported under the supervision of inspectors consisted of 390,554 cattle, 184,596 sheep, 22,623 horses, and 100 mules.

The number of certificates issued for cattle was 1,563; the number of clearances of vessels was 954.

The percentage of loss in export animals during the year 1894 was 0.37; in 1895 it was 0.62, and in 1896 it was 0.32.

The cost of inspection of export animals, the Texas fever work, and the inspection of animals imported from Mexico was $102,555.16.

Cattle and sheep inspected for export.

Fiscal year.	Cattle.				Sheep.		
	Number of inspections.	Number rejected.	Number tagged.	Number exported.	Number of inspections.	Number rejected.	Number exported.
1897	845,116	1,565	410,379	390,554	348,108	189	184,596
1896	815,882	1,303	377,639	365,345	733,657	893	422,603
1895	657,756	1,060	324,339	324,299	704,044	179	350,808
1894	725,243	184	360,580	363,535	135,780	.....	85,809
1893	611,542	292	280,570	289,240	.....	.....	.....

SOUTHERN CATTLE INSPECTION.

During the quarantine season of 1896 there were received and yarded in the quarantine divisions of the various stock yards 42,869 cars, containing 1,154,235 cattle; 43,529 cars were cleaned and disinfected.

The supervision and control of the movement of cattle from the district infected with Southern, or splenetic, fever involves the placarding of cars and the stamping of waybills, the proper yarding of Southern cattle so that they will not come in contact with susceptible animals, and, when reloaded at one station, the notification of the inspector at the point of destination or at intermediate stations. In the noninfected area in Texas 220,543 cattle were inspected and permitted to be moved to other States by trail and railroad for grazing.

INSPECTION OF IMPORTED ANIMALS.

The number of animals imported from Mexico and inspected at the ports of entry along the boundary line was as follows: Two hundred

and ninety-two thousand four hundred and seventy-nine cattle, 43,393 sheep, 12 hogs, and 171 goats.

An experiment is now in progress in Page County, Iowa, to determine to what extent and at what cost hog cholera can be prevented or controlled by sanitary regulations. The legislature at its last session passed a special act giving authority to destroy animals and to enforce necessary quarantine regulations. The funds available for this experiment are not sufficient, but it is hoped that the work may be sufficiently thorough in a part of the county to indicate what may be accomplished by the enforcement of such regulations. Experiments are also being made to learn what may be accomplished by killing only the plainly diseased animals and treating those exposed with hog-cholera antitoxin. It is yet too early to form an idea of the results that will be obtained through these experiments further than to state that the antitoxin evidently has a beneficial effect. The laboratory and experiment station are now engaged upon investigations looking to the production of an antitoxin of greater protective power and at less expense than has been possible heretofore.

PROPOSED EXTENSION OF MEAT INSPECTION.

The most pressing work of the Bureau of Animal Industry for the coming year is the extension of meat inspection to abattoirs engaged in the interstate business, which has not yet been included in the service. Until all the establishments which kill for shipment to other States have been included, the object of the law in preventing the sale of diseased carcasses for human food will not be accomplished, and there will be a discrimination in favor of those who have received the inspection and against those who have not been able to obtain it. There is also a demand for increased microscopic inspection, which is necessary to permit the marketing of American pork products in the principal countries of continental Europe. The exports of these products fluctuate largely from year to year, according to the condition of the market, and consequently it is impossible to foresee the expenditure which will be necessary to properly provide for the trade. There should either be an emergency fund which can be drawn upon for this purpose or the Department should be authorized to charge [illegible]asonable [illegible]nts—for each specimen microscopically [illegible]lected [illegible]become additional to the [illegible]emand [illegible] nigh be complied with.

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cost of the inspection, there would be no longer any reason for declining to extend it to all who apply for it, and the inspection could be applied to as many small pieces of pork as might be deemed necessary or advisable. At present inspection is demanded of pieces weighing only from 1½ to 3 pounds, and on account of the cost of inspecting such small pieces a limit of weight has been set (5 pounds), which is more or less unsatisfactory to the trade.

The inspection of export animals must be continued in order to certify to their healthfulness and maintain the market which has been secured for them in other countries. At present our live animals are shut out from most of the countries of continental Europe, and it is only by inspection and certifying to their healthfulness that we can hope to have these markets reopened.

INSPECTION AND QUARANTINE OF IMPORTED ANIMALS.

The inspection and quarantine of imported animals must also be continued in order to prevent the introduction of contagious diseases. While much progress has been made in the control of contagious diseases in European countries from which our stockmen import live animals, yet most of these countries are now affected with either pleuro-pneumonia or foot-and-mouth disease, or both. The prospects are that there will be more importations from Europe during the coming year than for several years past, and consequently the cost of this inspection must be somewhat increased.

INSPECTION CERTIFICATE TO INCLUDE MILK PRODUCTS.

It is suggested that an extension of the Government system of inspection and certification at present applied to meats and meat products for export to include butter, cheese, and condensed milk would be advisable and may perhaps be necessary in order to maintain the standing of our products in foreign markets. If a trade in pure butter or pure cheese is built up under existing conditions, it may at any time be ruined through the shipment by unscrupulous persons of adulterated products or those which have been preserved with agents generally considered harmful. No doubt a certification limited to products which would grade above a certain fixed and arbitrary standard would be a great benefit and aid in building up and maintaining a greatly increased trade in such products.

CATTLE AFFECTED WITH TEXAS FEVER.

The inspection and quarantine of cattle from the Texas fever district is an extremely important branch of the service, and it needs constant attention to prevent the infection of the central stock yards and the widespread dissemination of the contagion. When we consider that the quarantine line separating the infected from the uninfected district of the country extends from the Atlantic coast on the east to the

Pacific on the west and is over 4,000 miles in length, the difficulty in preventing violations of the regulations and the unlawful movement of infected stock can be appreciated. During the present year there have been more violations of the quarantine than for several years, owing, no doubt, to the increased demand for stock cattle. It will be necessary to take increased precautions during the next year to prevent the movement of cattle contrary to the regulations, or great damage to the domestic and export trade and a heavy loss of stock will result. The force during the present year is not sufficient to properly guard this line.

DESTRUCTION OF CATTLE TICKS.

Probably the most important work which the Pathological Division has had in charge has been the experimental study of the effect of the different substances in destroying ticks which spread the infection of Texas fever. It has been found recently that a petroleum product known as paraffin oil will destroy the ticks without greatly irritating the skin of the animals to which it is applied. It is thought by dipping the animal twice in this oil, with an interval of a few days, all the ticks will be destroyed, and the animals, even from the infected district, may hereafter be shipped with safety to any part of the country. If this hope is fulfilled the dipping of cattle from the infected district must soon become general and will save millions of dollars to the Southern States and more thoroughly protect Northern cattle.

BLACK LEG.

An effort is being made to prevent the losses from the disease known as black leg, or symptomatic anthrax, by distributing to the owners of herds where such losses occur a vaccine that will produce immunity. Some localities report losses from this disease ranging from 8 to 14 per cent. Heretofore the methods used in this country required two vaccinations, with an interval of ten days or more. The trouble and expense of a double vaccination, added to the cost of the vaccine, has deterred many stockowners from adopting this method of prevention. The Pathological Division is experimenting with a vaccine prepared by a special method which produces sufficient immunity to resist the disease with one vaccination.

RABIES.

[illegible] reported outbreaks of this disease have been [illegible] considerable number of tests made of animals supposed [illegible] rabies. A great variety of opinions have been [illegible] existence of rabies and the extent to which [illegible] are few institutions which are pre- [illegible] animals supposed to be infected with [illegible] consequently [illegible] the Pathological Division in

this direction is of great importance. A considerable number of undoubted cases of the disease have been discovered, and it has been found that some apparently unaccountable outbreaks of disease among cattle were really attributable to rabies.

ERADICATION OF SHEEP SCAB.

The design of the Department is to entirely eradicate sheep scab, and every effort will be made to bring this about. The work should be done on the ranch and on the farm. In many instances sheep owners have undertaken the complete eradication of this disease and succeeded. There is always more or less opposition when outside interference is brought to bear upon private management, but the general welfare of the sheep owners all over the United States requires that this disease should be eradicated. Intimate relations now exist between the sheep-breeding grounds and sheep-feeding grounds of the Northwest. Sheep are moved in large numbers from west of the Missouri to the grain fields east of it. The sheepmaster on the breeding grounds can obtain better prices for his stock by eradicating this disease, and much loss will be prevented to the feeder when he can buy healthy sheep.

HOG CHOLERA AND TUBERCULOSIS.

Experiments are also being made to determine the best methods of treating and controlling hog cholera and tuberculosis. The losses from these diseases are extremely serious, and every effort should be made to reduce them. In order to accomplish this it is plain that the Department must exercise fuller control over the movement of animals from one part of the country to another and prevent the dissemination of contagion by stock cars in which diseased animals have been transported. It is probable that more legislation should be enacted, giving the Department greater power in the stock yards that are used for interstate shipments, and that more positive authority should be granted for compelling the disinfection of cars and stock pens.

WORK OF THE BIOCHEMIC DIVISION.

This division has manufactured and distributed to State authorities sufficient tuberculin to test 57,000 cattle for tuberculosis and sufficient mallein to test 1,400 horses for glanders during the past year. This division has also succeeded in manufacturing an ink which is of great assistance in branding carcasses and pieces of inspected meats. Such branding answers the purpose of identification in many cases as well as seals and tags, and where used results in a great saving of money, since it can be applied much more rapidly and costs for material very much less.

WORK OF THE ZOOLOGICAL LABORATORY.

With a view to determining the value of German microscopic examination of pork for trichinæ, the various outbreaks of trichinosis in that country from 1881 to 1895 have been studied.

It is a remarkable fact that with all these cases of trichinosis which are laid at the door of German inspection and German pork, there was not a single case in Germany during the fifteen years referred to which the German sanitary authorities have been able to show was due to American pork.

The Zoological Laboratory has prepared for the use of the Bureau inspectors a bulletin on certain animal parasites found in meats, with special reference to their direct or indirect transmissibility to man.

For about two months the attention of this laboratory was occupied with a study of the parasites of the fur seal, undertaken at the request of the Treasury Department. An extensive report on this subject has been submitted to the United States Seal Commission for publication.

NEED OF AN ANIMAL EXPERIMENT STATION.

The work of this Bureau requires the use of an experiment station where a considerable number of experimental animals can be constantly kept. This is needed partly for the diagnosis of diseases met with in the inspection of meat and in the investigation of outbreaks of disease in various parts of the country, and also in the investigation of the nature of diseases and the best methods of treating them. The station which has heretofore been occupied by the Bureau has become insufficient for the purpose, and a change has therefore been made to a point farther from the city of Washington, and where more land can be obtained. The importance of continuing such investigations and of pressing them forward as rapidly as possible can not be overestimated, and no doubt the necessity for such work will continue for many years to come. I would therefore recommend that suitable grounds for such an experiment station be purchased, thus avoiding the necessity of moving from place to place and abandoning the improvements which must necessarily be made where this work is being conducted.

GREATER LABORATORY FACILITIES NEEDED.

I also invite attention to the importance of providing a fireproof building for the scientific laboratory. The building now occupied is unsuited for housing the valuable working material which has been accumulated during the thirteen years that the Bureau has been in existence. In the study of animal parasites, for instance, there has been intrusted to our zoologist the type specimens from the principal collections of the world. If these specimens were destroyed it would be an irreparable loss to science and to practical agriculture. So, in each division of the work there are specimens, literature, indexes,

and working material of all kinds which represent years of labor and which could not possibly be replaced.

This laboratory is a practical workshop, which aims to make constant and immediate returns to the farmers for the full amount expended for the scientific work of the Bureau. It is accomplishing this by the distribution of tuberculin, mallein, and black-leg vaccine, by bringing out the best methods of treating diseases, by determining and informing stock raisers as to the nature of diseases which affect their stock, by perfecting methods for making cattle insusceptible to Texas fever, and for killing the ticks which are the means of spreading the disease. These lines of work are worth millions of dollars to our farmers, and they should not only be encouraged, but put beyond the danger of interruption and ruin by fires and other avoidable accidents.

THE WEATHER BUREAU.

The extension of the scope of the Weather Bureau and its increase in usefulness are well known to the American people. In 1883 weather maps were not issued except at the central office in Washington, D. C. During the last fiscal year 4,315,000 maps were issued at 81 stations outside of Washington, D. C., and there has been an increase of 686,000 copies within the last two years to meet the constantly increasing demands of the public. In 1883 forecasts and warnings were sent to 8,094 places by mail, no other method of distribution, except through the daily press and the railroad train service, being then in use. During the last fiscal year daily forecasts and warnings were sent to 51,694 places by mail, telegraph, and telephone, and there has been an increase in the number of places receiving forecasts in the last two years of nearly 30,000.

CLIMATE AND CROP BULLETINS.

In 1883 no information was collected respecting the weather as influencing crops. Now climate and crop conditions are reported from about 8,000 places, and the results are summarized in the weekly climate and crop bulletins which are issued at each State center and republished by practically the entire press of the country, both rural and urban. There were in that year less than 300 voluntary observers in cooperation with the Bureau, and no systematic publication of their reports was made. Now there are about 3,000 voluntary observers making daily readings of standard Government thermometers and rain gauges, the daily readings being collected and neatly printed in tabular form at 42 State centers.

STORM-SIGNAL STATIONS.

In the year mentioned (1883) there were 41 stations on our seacoast and the Great Lakes where storm signals were displayed for the benefit of mariners. Now there are 253 stations where these signals are

displayed, at each of which, in addition to displaying signals, telegraphic bulletins giving the location, intensity, and probable movement of the storms, are distributed to vessel masters within one hour after the information is dictated by the forecast officials.

EXTENSION OF WEATHER SERVICE.

For the fiscal year ending June 30, 1884, the weather service cost $993,520. The appropriation for the current year is $883,772, which is $109,748 less than in 1883, while the work performed and the benefit derived by the public are much greater. The appropriation for the current fiscal year, however, is inadequate to meet the demands made by the people, either directly to the Bureau or through their representatives in Congress, for a material extension of the benefits of the weather service. It is necessary to establish and equip new stations at important centers of population. The amount now appropriated is barely sufficient for the actual working force at the meteorological stations, leaving no opportunity for the extension of the present system or the establishment of new stations. It is only with the utmost care, and by requiring from nine to twelve hours' work every day in the year, including Sundays and holidays, at a majority of our stations, that the important duties of the service can be performed. Every mail brings urgent requests from representatives in Congress, farmers, mariners, merchants, and professional men for extensions which it is impossible to make.

MONEY NEEDED FOR NEW WEATHER BUREAU STATIONS.

An increased appropriation of $160,348 in the estimates for the Weather Bureau for the next fiscal year has therefore been asked for. This increase contemplates the establishment of several stations in the Southwest of our country, where an extensive area is not now included in the domain covered by meteorological observations. This unprotected region includes large portions of Nevada, Utah, Arizona, New Mexico, and southeastern California. Four or five additional stations should be established in this territory. The weather conditions which cause frost in the orange and raisin sections of California drift in a southerly direction from the north and northeast. The giving of accurate frost warnings for the extensive fruit interests of California [illegible] the additional stations above referred to.

[illegible] IMPROVEMENTS

[illegible] $[illegible],000, [illegible] above the amount [illegible] for the purpose of purchasing [illegible] [illegible]ntary observers of the Weather [illegible]reau, [illegible] present time. These shelters [illegible] enable [illegible] to obtain more accurate climatic observations,

since the thermometers will be so exposed as to have free circulation of air, and yet will be protected from sunlight, rainfall, and radiation from surrounding structures. Many employees are now engaged in collating and publishing these reports for the purpose of establishing the climatic features of every portion of each State in the Union. It is an unwise economy that does not provide for the taking of accurate observations upon which so much subsequent time and labor are expended.

An item of $5,000 is included for the purpose of erecting a small brick and stone building on the Government reservation between the two canals at Sault Ste. Marie, Mich. The average number of vessels passing through these canals in the season of navigation is 80 per day. The Weather Bureau office at that point is maintained chiefly in the interests of shipping, and its location should be on this Government reservation, where it can be of the greatest service to vessel masters.

LOCATION OF WEATHER BUREAU OFFICES.

It is of great importance that offices be located with a view of securing several advantageous conditions. Nearness to the press, the telegraph office, and, if at a lake port, proximity to the harbor are important conditions in securing prompt and effective distribution of storm warnings and weather information. Besides providing for these, the proper exposure of meteorological instruments must not be overlooked. It is apparent that economy in expenditure should not induce the Government to locate its meteorological observatories in other than the most advantageous surroundings. Under no circumstances should the accuracy of the meteorological readings be subordinated to the desire to secure quarters rent free.

NEW WEATHER BUREAU STATIONS FOR CITIES.

Additional stations are also needed to meet the demands of many cities which, though not so situated geographically as to furnish the Bureau useful observations for its storm warnings, are still so important in their manufacturing, marine, and other industries as to render it advisable to establish complete meteorological stations in their midst, to preserve a record of the prevailing atmospheric conditions. Such a record would be exceedingly useful in the development of their industries, and would make it possible to have a more complete system of distribution of storm warnings than obtains at present. There are to-day over fifty cities having a population of over 50,000 with no Weather Bureau station. The storm-warning service long ago outgrew the experimental stage. It has demonstrated its usefulness to such an extent that only the most efficient appliances should be used for conveying its warnings to mariners.

THE MISSISSIPPI FLOOD OF 1897.

There was an extensive flood last spring in the Lower Mississippi River region. Fifteen million dollars' worth of farm products and live stock were found by this Department to be within that region. Successful forecasts were made weeks and days in advance, to the great profit of the residents of the flooded area. The river service is composed of 22 sections, each with a central office receiving reports from a definite area and each making local forecasts for the river district under observation. In the case of an impending disaster, such as was imminent last spring, the central office at Washington dictates important warnings for distribution by the section center. During recent years a very thorough reorganization and systematization of the river and flood service has been effected. From the local observers who measure rainfall and gauge river heights to the trained meteorologists who are in charge of the river center, from the latter officials to the forecast officials at the central office, and from these to the Chief of the Bureau the organization has been slowly strengthened, until it is believed that the Bureau is able to serve the public efficiently during an emergency.

EFFECTIVENESS OF STORM WARNINGS.

No one of the ten West India hurricanes which swept our Atlantic and Gulf coasts during the past few years reached any harbor without danger signals being displayed well in advance. The extensive truck gardens of the South Atlantic States received full warnings of frosts of marked severity, and all cold waves of any considerable extent were successfully forecast in the interests of shippers of perishable produce and manufactures.

Gratifying success attended the warnings issued for the benefit of the fruit industry of Florida, the sugar interests of Louisiana and Texas, and the truck-growing districts of the Eastern seaboard.

The rain warnings issued from the San Francisco office for the benefit of the raisin industry during the drying season, and on the accuracy of which that industry is greatly dependent for success, were in every instance verified. The official in charge of the San Francisco office states, in reference to the work of the Bureau in this particular, that during the last three years not a single rain occurred in the raisin-drying region without warning, and in only one instance was an unnecessary warning issued.

GROWTH IN VALUE OF THE WEATHER SERVICE.

These facts testify to the great value of the Weather Bureau. It has far outgrown in accuracy and usefulness the largest anticipations of its founders, and has fully demonstrated the wisdom of the American scientists whose investigations make such a service possible.

Its warnings save many millions of dollars annually to the agricultural and marine interests of the country, and the numerous demands made by those interests for an extension of the service should be honored by a material increase in the appropriations for the support of this valuable Government institution.

STANDARD DANGER SIGNALS DESIRABLE.

During the period mentioned (1883 to 1897) the danger signals displayed at lake and ocean ports have increased in number from 41 to 253. These danger signals, notwithstanding they are a great aid to navigation and result in the saving of thousands of precious lives annually, are in many cases made by old and obsolete appliances. The signals are of such value as to justify an appropriation of funds that will equip these stations with the most improved appliances for conveying danger warnings to mariners. While the saving of life should be our first consideration, I am informed that conservative estimates made by those interested in shipping, indicate that one hurricane sweeping the Atlantic Ocean unannounced by signals would cause a damage to floating craft of two to four million dollars. Therefore commercial interests would be subserved by equipping in the most efficient manner each station with such mechanical appliances as have, by recent experiments, been adopted as standards.

EXTENSION OF METEOROLOGICAL SERVICE.

Twenty-seven years ago the meteorological stations of the Weather Bureau were established. Since that time many cities have grown to greater proportions than the cities in which the original stations were located. I am informed that it will be necessary to discontinue some stations at less important cities for the purpose of establishing observatories in the more important places, unless provision is made for the extension of the service. The fact that in no case has a city given up its local meteorological service without vigorous protest, is sufficient evidence that such local service should be maintained and that like service should be extended to cities of equal importance.

STUDY OF THE UPPER AIR WITH KITES.

The work of the preceding year in regard to obtaining observations in the upper air by means of kites has been continued. The object of these observations will be to further studies in regard to the mechanics of storms, and to prepare synoptic charts from simultaneous readings taken in the free air at an altitude of not less than 1 mile, with a view to increasing the percentage of forecasting accuracy. Many improvements have been made in these kites during the past fiscal year, and the results attained seem to justify a considerable extension of the work during the ensuing year, the preparations for which are now well under way.

DIVISION OF VEGETABLE PHYSIOLOGY AND PATHOLOGY.

Valuable work has been continued by this division in the study of diseases affecting forest and shade trees; diseases affecting plants under glass, a matter of much interest to a great many of our people; diseases of the Bermuda lily, caused by methods of propagation and handling; diseases of the rose, violet, and chrysanthemum, and diseases of Southern watermelons. Diseases affecting cotton, cowpeas, market-garden crops, and pomaceous and allied fruits have also been studied.

Experts are detailed continually to make a study of the diseases affecting fruits and other crops of the Pacific Coast. The English walnut is rapidly becoming an important industry in California, and treatment of a bacterial disease affecting it has been successful over large areas. Bacterial diseases of tobacco have also been studied during the past year.

Publications have been prepared treating of the apple canker of Washington and Oregon, fig fermentation, black rot of the navel orange, diseases attacking the raisin crop, etc.

The division has also engaged in field experiments of wheat to test the resistance of the different varieties to rust and other diseases, and to obtain facts regarding their value to the different wheat-producing regions of the country, in cooperation with the Kansas Experiment Station. It has continued the study of the nutrition of plants grown under different conditions, and in connection with this the study of conditions of soil, climate, and other important factors affecting plants in the different parts of the country.

The new problems presented where irrigation is practiced are receiving earnest attention.

BIOLOGICAL SURVEY.

Two principal lines of work are carried on by the Biological Survey—a study of the geographic distribution of animals and plants, with a view to determining the boundaries of the natural life zones and their subdivisions, and the study of the food habits of birds and mammals, for the purpose of ascertaining the economic relations of our native species. Work along both of these lines has been continued.

During the past fiscal year field work has been done in Washington, Oregon, California, Nevada, Utah, Wyoming, Nebraska, Kansas, Indian Territory, West Virginia, Mexico, and western Canada.

[illegible] has been made to ascertain the boundaries of the [illegible] species of plants and animals in the northwest [illegible] particularly in Oregon and Washington.

[illegible] AND OATS.

[illegible] with a view to determining results [illegible] graphic distribution and making them

immediately available for practical agriculturists. The first investigation had for its object the determination of the varieties of corn, wheat, and oats which should be most profitably cultivated in each of the natural life zones of the United States. This work is being done in conjunction with Prof. C. S. Plumb, of the Indiana Experiment Station. Information regarding the different varieties of cereals has been collected from more than 1,000 grain growers, located in different parts of the United States and the Canadian provinces.

The work of the Biological Survey is a prime necessity, in order that the Department may have a correct knowledge regarding the localities to which imported seeds and plants should be sent.

ECONOMIC RELATIONS OF MAMMALS AND BIRDS.

Studies of the economic relations of the various mammals and birds have been continued during the year, and special effort has been made to obtain a sufficient number of birds' stomachs to complete investigations already begun on the food of certain species. More than 3,000 birds' stomachs have been added to the collection, and 2,342 have been examined. This work will result in giving correct information to the agriculturist as to which birds are his friends and which are his enemies.

The main object of the work of this division is the collection and dissemination of information regarding the geographic distribution of birds and mammals, particularly those of economic importance.

FIBER INVESTIGATIONS.

A ton of flax straw grown in the Puget Sound region of Washington, under the direction of the Office of Fiber Investigations, was sent to a firm of famous flax manufacturers in Lisburn, Ireland, to be scutched and retted in order to determine the grade of the flax so produced. A very superior quality of straw was produced, resembling the straw of the famous Courtrai region of Belgium. With the Irish report was received a large assortment of flax samples, the best scutched fiber of which is valued therein at $350 per ton; but out of the lot sent from Washington, fiber was hackled worth $500 per ton. This experiment also demonstrated conclusively that it is possible to obtain good fiber and good seeds from the same plant. The success of the experiment has stimulated experiments in other parts of the Pacific Coast, and in Oregon, particularly, considerable fiber flax is being grown this season.

Interesting experiments are being conducted in the ginning of Egyptian cotton.

HEMP AND RAMIE MACHINES.

Large quantities of hemp are grown in Nebraska. It is intended to arrange for an official trial of hemp machines next season in connection with the forthcoming Omaha Exposition. The interest in new

ramie decorticating machinery continues, and several new machines are ready for test. A trial of these machines was to have been held this fall, but a proper growth of ramie could not be assured, owing to the converting to other use this season of the ramie tract at the point where the Government trials are held. A new French machine now turns out raw fiber approaching in quality the China grass of commerce, though the capacity of the machine has yet to be tested before the Department can make any authoritative statements regarding its ability to turn out fiber in paying quantity.

All our figures of the relative yield of ramie fiber per acre are based on foreign tests or on mere estimates put forth by those interested in machines. It is the purpose to secure, if possible, a ton or more of Southern-grown ramie ribbons, which will be stripped and dried under the direction of the Department, and afterwards treated for the spinning fiber by Department chemists, and, at the same time, by spinners in the United States who are contemplating manufacture, and who control commercial degumming processes. It is important to settle the question of absolute yield.

DIVISION OF CHEMISTRY.

The character of the work carried on in the Division of Chemistry is shown in the following summary:

STUDY OF TYPICAL SOILS.

The value of the study of the typical soils of the United States has been enhanced by securing from the celebrated experiment station at Rothamsted, England, samples of a few of the soils whose history has been carefully noted at that station during the past fifty years. These samples were kindly furnished by Sir J. Henry Gilbert, who, in conjunction with Sir John Bennet Lawes, has had charge of the experimental work at that station for the past sixty years.

A direct comparison has been instituted between these soils, whose history has been known for so long a period, and the typical soils which have been secured from various parts of this country.

The cha[illegible] of the work has not varied greatly from that of pre-[illegible] ne important changes in the details have been [illegible] previous years the amount of moisture in the [illegible] determined chiefly by an inspection of the [illegible] weighing [illegible] not containing the sample of [illegible] sion of ar [illegible] vever, i[illegible] th[illegible] advantageou[illegible] ture present. To [illegible] made, so that the

quantity of moisture which has been evaporated during the seven days is directly determined. Knowing the quantity necessary to produce complete saturation of the soil, a simple calculation will show the amount to be added in order that the amount of moisture in the soil shall be between 60 and 70 per cent of the total quantity necessary for its complete saturation.

IMPROVED METHODS OF EXPERIMENT WITH SOILS.

The method of weighing has been improved by an ingenious mechanical device which renders it possible for one person, without assistance and without undue physical exertion in the way of lifting the pots, to weigh the whole number, viz, 176, in about four hours.

Important improvements in the method of applying the moisture have also been inaugurated, which have been the result of the experience of the past few years. The use of glass measuring vessels has been discarded, and a large number of tin vessels of conical shape, holding 2 pounds of distilled water, have been employed. By these improved means it is quite possible to add one portion of water to each of the pots in the course of two hours.

The general control of the crops growing on these soils has been continued as in previous years. Oats and beans are grown during the first half of the season in duplicate samples of typical soils. After the harvest of these crops the soil in the pots is again prepared for planting and a crop of buckwheat grown thereon. By this method two crops are secured during each season, thus increasing the value of the experimental work by duplicating the data obtained.

PROPOSED PRELIMINARY REPORT ON SOIL CONSTITUENTS.

A careful study is made of the total amount of dry matter produced in each pot, and the quantity of nitrogen, phosphoric acid, and potash removed from the soil by each crop is determined. The data of four seasons are now at hand, and while it is not claimed that these data are sufficient to establish all the points in question, they are at least sufficiently extended to warrant the preparation of a preliminary report, which is now under way. This report will contain statements in regard to the composition of the soils, their physical character, their water-holding capacity, their content of humus, and the percentages of nitrogen, phosphoric acid, and potash contained therein, both as regards total content and in respect to the quantities removed by different solvents.

These data will be illustrated not only by analytical tables, but also graphically in such a way as to show in the most evident manner the relation which exists between the physical and chemical composition of the soil, its content of moisture, and the quantity of dry organic matter produced.

STUDY OF FOODS.

Cereal products have been studied during the past fiscal year. The composition of the different varieties of flour, meal, and the by-products of milling has been carefully established by elaborate chemical investigations. Valuable data in regard to the heat-giving properties of foods have thus been secured, and it has been ascertained that the combustion is a valuable check on the accuracy of the chemical analyses. The work of investigating these food products has been particularly complicated. It has covered the whole range of flours, meals, and milling by-products of every description carried on since 1883. The report will soon be ready for publication.

COOPERATION OF THE ASSOCIATION OF OFFICIAL AGRICULTURAL CHEMISTS.

The excellent results which have been obtained by the active cooperation of this Department with the Association of Official Agricultural Chemists have been recognized and acknowledged in all quarters of the world. Especially in the United States have these results been of inestimable value in unifying and coordinating the methods of analyses employed in the various experiment stations and other laboratories of the country. A comparison of the methods of procedure at the present time with those which were in vogue fifteen years ago would serve as an unanswerable argument in favor of the continuation of the cooperation which has been so harmoniously established and maintained.

In the active work incident to this cooperation the Division of Chemistry has taken a prominent part. All of the subjects which are assigned for investigation by the Association of Official Agricultural Chemists are fully and patiently studied by the chemists of the Department. The contributions which have been made in this way from the Division of Chemistry have done much to secure the high standard of analytical work which now obtains in the United States among our agricultural chemists. So firmly has this standard been established and so excellent have been its merits, that it has commanded the approval and suppo[illegible] of commercial chemists and those engaged in [illegible]iginal investigatio[illegible]

[illegible] INVESTIGATIONS.

[illegible] afforded the Division of [illegible] June 30, 1898, it will not be possi- [illegible] investigations much beyond the plan fol- [illegible] investigation of foods will be [illegible] consideration being the compo- [illegible] foods. This subject is

of such a wide scope that it will be all the work which it will be possible to do in this line during the year.

The work in the typical soils of the United States will be continued along the lines already followed for the purpose, either of ascertaining new facts in regard to the relation of soil to crop, of confirming the results of investigations already made, or of correcting them in order to make them conform to the new discoveries which may be made.

SUGAR-BEET INVESTIGATION.

The work in the investigation of sugar-producing plants contemplates the analysis of samples grown by farmers in different parts of the country from seeds furnished by the Department. From arrangements which have already been made by these farmers, it is indicated that 5,000 or 6,000 samples of beets will be sent to the Department for analysis during the months of September, October, and November. Preparations have been made for the accomplishment of a large amount of chemical work, and it is hoped that valuable information may be secured thereby in regard to the quality of soil and climate in different localities where beets can be produced with a high content of sugar. A study of the composition of beets grown from high-grade seeds, under the direction of the Chemical Division, will also be conducted. These beets have been grown at six of the experiment stations of the country, so distributed as to represent a wide range of climatic conditions.

In the miscellaneous work of the division it is also proposed to continue the investigations which have been undertaken, and not concluded, regarding methods of determining starch in cereals and other starch-containing plants. This is one of the most difficult operations in analytical agricultural chemistry, and has been the subject of wide discussion in all parts of the world.

INQUIRY AS TO USE OF STREET SWEEPINGS.

An investigation of the disposition which is made of street sweepings and other refuse of cities has been undertaken by this division and will be prosecuted vigorously during the coming year. The division has placed itself in communication with all the cities of the United States having a population of 10,000 and over. It has also perfected arrangements for obtaining information in regard to disposition of street sweepings and sewage in the largest cities of Europe. The importance of this work is twofold; first, from a hygienic and economic point of view, in regard to the best method of disposing of this refuse; and, second, from a manurial point of view, in regard to the value of these materials for fertilizing purposes. In cases where garbage and street sweepings are burned a study of the resulting ashes will be made for the purpose of determining their fertilizing value. It is hoped that a material advantage will accrue from this

investigation, both to the cities, in respect of the method of disposing of the refuse, and to the farmers, in respect of securing a new fertilizing material at a low price.

DIVISION OF ENTOMOLOGY.

The work of the Division of Entomology may be classified under the following heads:

Investigations upon specific injurious insects or groups of insects, experiments with insecticides and insecticide machinery, determination of species sent in by the entomologists of the State experiment stations and by other workers, general investigations of the life histories of injurious insects, bibliographic work, and the work of preparation of circulars and publications.

SPREAD OF THE SAN JOSE SCALE.

Investigations have been made supplementing the report made in 1896, regarding the spread of the San Jose scale. While the State experiment stations have shown great interest in this work and have undertaken the investigations with energy, it seems proper, nevertheless, that the records should be kept in the office of the Department, so that at any time a supplementary bulletin may be published. Many entomological experts, as well as fruit growers, find great difficulty in distinguishing between the San Jose scale and several closely allied species which occur on fruit trees.

The office of the Entomologist in the Department is kept busy by the requests from persons for the examination of scale insects in order to decide their identity. A bulletin has been prepared covering these points.

STUDY OF THE MEXICAN COTTON-BOLL WEEVIL.

An agent was sent to Mexico in the spring of 1897 to study the Mexican cotton-boll weevil in its original home, for the purpose of ascertaining whether parasites exist there which could be imported into Texas with benefit, and the occurrences and spread of the species during the present year in Texas have been studied with care.

FOREIGN [illegible]

[illegible] to the consid- [illegible] insect pests from [illegible] address before [illegible] entomologists held [illegible] the desirability [illegible] article in the [illegible] information [illegible]

MISCELLANEOUS INVESTIGATIONS.

During the past year the Division of Entomology has been conducting experiments with new and old insecticides with regard to their effects on the foliage of different plants under varying conditions.

General investigations of the life histories of injurious insects are carried on in the insectary building and adjoining garden plat. During the fiscal year notes were recorded upon 502 species which had never before been studied in the insectary.

Investigations in the general subject of insects injurious to shade trees in cities and towns have been continued; also investigations of insects affecting stored foods.

ENTOMOLOGICAL PUBLICATIONS.

A great demand exists for some of the bulletins of this division, especially for those treating of insects in the household and insects affecting domestic animals. Owing to legal limitations, the editions of some of the bulletins most frequently called for are small, and many applicants have to go unsatisfied. A bulletin treating of the degree of temperature at which certain insects affecting household goods and foods remain inactive affords information especially valuable to cold-storage companies, and may result in a reduction in the charges of cold-storage companies during the summer months.

Publications have been issued by the division relative to insects affecting stored vegetable products; also a Farmers' Bulletin on insects injurious to stored grains.

ENTOMOLOGICAL INVESTIGATIONS IN CONTEMPLATION.

By special direction of Congress this Department was authorized to conduct, during the fiscal year 1898, an investigation of the ravages of the gypsy moth. Accordingly the work was laid out for the beginning of this fiscal year, so that a report on the subject might be prepared as early as possible.

The work along certain general lines indicated in the foregoing sections will be prosecuted. The Mexican cotton-boll weevil will be carefully watched, and further efforts will be made to obtain Mexican parasites. The investigation of insects injurious to shade trees, insects affecting stored foods, insects affecting citrus fruits, geographical distribution of injurious insects in this country, bibliographical work, and experimental work with insecticide machinery will all be continued. Another investigation will be made upon the injurious grasshoppers of the far West. It is obviously impossible to anticipate the special subjects for investigation which it may at any time become necessary to undertake. The beginning of nearly every season brings some injurious species prominently to the front, and when this species has not already been investigated,

new work must be begun. There has long been need of a complete practical bulletin on the subject of the Hessian fly. It is planned to prepare such a bulletin. A similar work relating to the chinch bug will also be prepared during the coming year. Experimental work in apiculture comes properly under the head of "Entomological investigations," and will be resumed under capable supervision. The honey-producing industry is a large and growing one, and deserves some slight encouragement at the hands of the Government.

SEED DISTRIBUTION.

The appropriation of $150,000 for the distribution of seeds for the fiscal year ending June 30, 1897, provided that $130,000 must be expended for the purchase of seeds, leaving $20,000 for putting up and mailing the same. The seeds were purchased already put up in packages and mailed from the different cities where the contracts were held. The appropriation for the present fiscal year is $130,000, of which amount $110,000 must be expended in the purchase of seeds. The conditions of the law will require contracting with the smallest possible number of seed houses. The purchase of bulbs, plants, cuttings, etc., must be paid from the remaining $20,000.

The spirit of the law requires that the seeds, plants, bulbs, etc., be rare and valuable. Efforts are being made by the present Secretary of Agriculture to spend the appropriation for seeds, plants, etc., by purchases through agents and representatives abroad, through seed houses and scientific associations. The Old World contains many things that would be valuable to the New World. All this work, however, must be paid for out of the $20,000 appropriated and not required to be expended for the purchase of seeds. The distribution of imported seeds and plants to the several experiment stations throughout the country and otherwise must be paid for out of the $20,000 fund. This will necessarily circumscribe efforts in this direction. It is desirable that more of the appropriation given for seeds should be available for the introduction of what is new and rare.

SECTION OF FOREIGN MARKETS.

The Section of Foreign Markets was instituted March 30, 1894, under a clause in the act of appropriations for the Department of Agriculture setting aside $10,000 for the purpose of making "investigations concerning the feasibility of extending the demands of foreign mar- [illegible] agricultural products of the United States."

[illegible] appropriation has been expended chiefly in the preparation of [illegible] of bulletins and circulars designed to convey information [illegible] such opportunities as exist for the extension of our export [illegible] farm products. During the period beginning with [illegible] 1894 and ending June 30, 1897, eight [illegible] offers of countries, and 17 circulars, [illegible] public.

PUBLICATIONS RELATING TO CERTAIN COUNTRIES.

The countries treated of in the bulletins already issued are (1) the United Kingdom of Great Britain and Ireland, (2) the German Empire, (3) France, (4) Canada, (5) Netherlands, (6) Belgium, (7) Norway, and (8) Sweden. Each country is considered with a view to its possibilities as a customer for the products of American agriculture. To ascertain what these possibilities are it is important, first of all, to be informed as to the agricultural resources of the country under consideration. A full account, therefore, is given of the extent and character of the principal crops grown, and also of the number and varieties of stock raised. This is followed by a careful review of the country's foreign commerce, and more particularly of its import trade in agricultural produce, the purpose being to show how far the national requirements exceed the home supply, making it necessary to import from other countries. Official statistics are presented as to the quantity of the various products annually imported and the different sources from which they are received; and these facts are accompanied by such information regarding customs duties and regulations, equivalents of foreign moneys, weights and measures, rates of exchange, etc., as may be of service to American producers in quest of a foreign market.

Each bulletin is supplemented by a series of reports received through the medium of the State Department from our consular representatives stationed in the particular country concerned. The object of these reports is to set forth such facts regarding the several consular districts as are likely to assist in creating there a larger demand for our products. With this end in view they frequently give important information as to the nature and quality of the goods preferred, methods of sale, prices paid, means of transportation, etc., enhancing thereby the practical value of the bulletins.

OFFICE OF ROAD INQUIRY.

During the past fiscal year many important meetings have been held in the several States and considerable information has been collected for distribution. The literature of the office now numbers 20 bulletins and 15 circulars of information, which have been in much demand. During the present spring and summer experiments have been made, in conjunction with several of our experiment stations, under the direction of the Director of the Office of Road Inquiry, with such materials as were found in the localities where the experiments were conducted. Many localities in the United States have not the materials fit for making permanent roads, and for this reason the office has endeavored to promote experiments in steel roadbeds. Two sections of roads were built at the Agricultural College experiment station in New Jersey during the month of June. A piece of

road 1½ miles long was also built at Geneva, N. Y., connecting the experiment station with the city.

In response to circulars sent to the principal steel manufacturers in the United States, various plans of construction have been offered. It has been well demonstrated that a well-designed steel trackway can be successfully built and profitably maintained, especially in localities where other materials are scarce. The considerable expense involved in preparing special shapes of rails has prevented much experiment in this direction heretofore; one company, however, is disposed to aid in the matter whenever a definite order for 1 mile of road shall be received. The cost of material for a mile of road will be $3,500. Heretofore the Director of the Office of Road Inquiry has succeeded, by the expenditure of a minimum amount of Government money, in inducing local representatives to contribute considerable amounts to these road-building experiments.

DIVISION OF AGROSTOLOGY.

The work of this division, as authorized by Congress, is the investigation of grasses and forage plants, embracing all points relating to their natural history, geographical distribution, uses, and adaptability to special soils and climates. The law also authorizes the establishment and maintenance of experimental grass stations and the employment of necessary labor and purchase of supplies for carrying on the work. There are two grass gardens maintained by the division. One is located on the grounds of the Department of Agriculture and the other at Knoxville, Tenn. During the past fiscal year between 400 and 500 varieties of forage and grass plants were sown on the grounds of the Department, furnishing an interesting object lesson to the people and an opportunity for study by scientists. The seeds were procured through the collections of field agents and by exchanges with foreign countries.

The grass garden at Knoxville embraces about 7 acres of ground, and cultures there are conducted upon a more extensive scale. More than 200 varieties were grown in this garden during the past year. The design of the Knoxville garden is to obtain information which will be useful to the Southern States relative to grasses for pastures and meadows.

FORAGE PROBLEMS IN THE CATTLE RANGES.

There is especial necessity for the study of forage problems throughout the southwest portion of the United States, including the States of Texas and Kansas, and the Territories of New Mexico and Arizona, giving special attention to the native grasses and forage plants, their abundance and value, their preservation and the possible methods to be employed in restoring the grazing value of those regions which have become valueless through overstocking or other causes.

The Division of Agrostology has placed itself in communication with such parties as are interested in improving the forage conditions of the Southwest for the purpose of gaining, first, a more definite idea of the present conditions, and second, how best to improve these conditions. There is a deep interest among the people of the Southwest in this work. More than 1,000 answers have been received from circulars sent out, seeking information regarding actual conditions. The division has also given attention to similar conditions in the Dakotas, Wyoming, Colorado, and adjoining States. Cordial cooperation is had in the States mentioned with the scientists of the experiment stations.

GRASSES FROM DRY REGIONS OF THE OLD WORLD.

The demand for new and improved forage plants which will grow and thrive on the farms of the Southwest and Northwest is continually on the increase. The Secretary of Agriculture is now making efforts, through agents in the Old World, to introduce grasses from regions which are semiarid and that grow under other conditions that may make them suitable for these localities. A system of exchange is being carried on with scientists in Australia, Algeria, northwest India, and with the botanical gardens of several of the countries of the Old World.

Careful study is given to the adaptability of certain plants to special soils and climates throughout all the States. Propagation of sand and soil binding grasses, those best suited for the formation of turf in numerous places along our seaboard and Great Lakes, which will prevent the movement of drifting sands, is a subject that has received the attention of the division.

DIVISION OF GARDENS AND GROUNDS.

The collection of plants in the conservatory proper is mostly of those having economic value, and serves as a nucleus from which selections are made of such as appear to merit propagation for experimental purposes and introduction as industrial plants, if a suitable climate can be found for their growth.

Attention is given to the growth and propagation of the pineapple, the citrus family, olive trees for the production of cuttings, and for other similar purposes. About 20,000 various ornamental plants are propagated annually to supply the flower garden and flower beds on the Department grounds.

DISTRIBUTION OF PLANTS.

The distributions during the last fiscal year consisted mainly of 36,500 strawberries, 7,000 native and foreign grapes, 3,900 olive plants, 2,900 camphor trees, 4,000 fig cuttings, and a large number of plants such as guavas, cinnamon, pepper, citrus, vanilla, coffee, etc.

The United States imports large quantities of plants and plant products that might be produced in our own country. As many of these as possible will be propagated under the direction of the Superintendent of Gardens and Grounds and distributed, in order to contribute to our independence in this regard.

CAMPHOR AND OLIVES AS NEW CROPS.

The camphor plant may be taken as an example of the introduction of a new crop. For more than twenty years the Department has been distributing this plant in the extreme Southern States, first as a shade tree and as a shelter to orange groves, and more recently as of very promising industrial value. After all these years planters are now taking a special interest in its culture, trees are in great demand, and their value as economic plants will be properly tested.

With regard to future work exclusive of ordinary care of the grounds and glass houses, the propagation of such economic plants as may seem advisable will be continued. At present the olive is the leading factor in propagation, as it is considered desirable to fully introduce and encourage olive culture in such of the Southern States as seem suited to its profitable growth.

DIVISION OF SOILS.

The most important lines of work carried on during the past year have been an investigation of the soils of Florida; a continuation of the investigations of the principal tobacco soils of the United States; the perfection of the electrical methods of determining the moisture, temperature, and salt content of soils; the study of the moisture content of a number of the important soil formations of the country; a continuation of the investigations of the physical properties of soils; and the devising of methods for the practical study of soil conditions.

REPORT ON FLORIDA SOILS.

A bulletin is in course of preparation on the preliminary study of the soils of Florida, particularly those adapted to tobacco, truck, and pineapples. A large amount of field work was done in Florida in the early spring and a great many soil samples were collected there that have since been examined to determine their physical texture; a few chemical analyses have been made by the Division of Chemistry to [illegible] light upon some of the problems presented. Records have also [illegible] kept of the amount and daily fluctuation of the moisture in [illegible] hammock high pine, and scrub land in the State during the [illegible] throw an important light upon the agricultural [illegible] formations of the State and the local dis-

[illegible] bulletins now to over 3,000 [illegible] the United States and several foreign

countries, representing many of the most important soil areas of the world. About one-half of these have been carefully examined. Many of the results have been published, while others await the collection and examination of more material, in order to develop special lines of investigation or to write up the soils of special agricultural areas or industries.

WATER CONTENT OF SOILS.

Much time has been given, as heretofore, to the study of the water content of various soils, to determine the normal quantity in soils of different formations and of different agricultural areas as well as the normal variation which may occur in the water content without detriment to the plants. The importance and bearing of this work can only be really appreciated by seeing the relation of the soil moisture to the general economy of plant growth.

Under ordinary circumstances the temperature of the air is a prime cause of the evaporation or loss of water by plants; the relative humidity of the air, together with the general atmospheric movements, controls the evaporation, while the moisture of the soil supplies loss due to evaporation. For a steady and continuous growth of plants there must be a certain relation therefore between temperature, which is the cause of evaporation, relative humidity, which is a controlling factor, and soil moisture, which supplies the loss. It has been possible to determine from the field records what may be called the line of drought for a number of the important soils of the country. This is the minimum amount of water which the soil must contain under ordinary conditions of temperature and humidity in order that the crop shall not suffer. This line of drought depends, of course, upon the texture of the soil as well as upon the temperature of the air, the kind of plant, and the stage of development. The texture of the soil has an influence on this, because in a soil of fine texture, made up mainly of clay and fine sand, the movement of water is quite slow, and there must be a large quantity of water in the soil to insure an adequate supply moving up to the roots of the plant to replace that lost by evaporation. This explains the well-known fact that a plant may thrive in one soil with 5 per cent of water, while it would perish in another soil containing 15 per cent.

RECORDS TO ESTABLISH DROUGHT CONDITIONS.

The temperature and relative humidity of the air affect this line of drought, because with a low temperature and a high relative humidity there is comparatively little loss of water and a smaller supply in the soil may be ample, while with a high temperature, unless this is balanced by a very high humidity, there will be a greater evaporation from the plant and a larger amount of water will be needed in the soil to insure an adequate supply to the plant. The kind of crop and the stage of development will obviously affect the location of the line of drought for any soil, as different plants require different amounts

of water, and this differs again according to the stage of the development. The water supply of the soil is, therefore, a very important factor in climatological studies. It is clearly possible to establish approximately for any soil and for any crop the relation which must at all times exist between the temperature, the relative humidity of the air, and the amount of moisture that must be present in the soil to maintain the balance. To this end records have been kept of the amount of moisture in a number of the principal soil formations of the country, some of the records extending over three or four seasons, accompanied with careful notes of the daily condition of the soil and of the plants.

MEASUREMENT OF SOIL MOISTURE.

The electrical method of moisture determination already described in a bulletin issued by the division has been still further perfected. Sixteen stations have been equipped with these electrical instruments in various parts of the country and in several important types of soil. Records have been kept at these stations for periods varying from two to four months, and it has been found that the method can be used by anyone with ordinary care. As a result of these field records I feel perfectly satisfied with the operation of the method, and equally satisfied that it will prove of great value in soil investigations, as well as of practical and commercial value. One great value of the method is that the electrodes are permanently buried in the field at any depth desired and the field can be cultivated or cropped as usual. The electrical resistance between the electrodes is read off from a scale, and this resistance varies according to the square of the water content. By once thoroughly standardizing the electrodes, therefore, and by the use of tables which are furnished by the division, the moisture content of the soil can be determined at any time from the electrical resistance of the soil.

INFLUENCE OF CULTIVATION ON WATER CONTENT OF SOILS.

Having perfected this method of moisture determination, in which the moisture can be rapidly and readily determined successively at the same point without any disturbance of the soil, it is possible to study in a very satisfactory way the influence of different methods of [illegible] of fertilization, and of irrigation upon the water content [illegible] very practical work, made possible only by [illegible] under con- [illegible] hods of cul- [illegible] of the soil [illegible]

[illegible] physical [illegible] determining these in

the field. Some very important results have just been attained, explaining more fully than ever before the real cause of the capillary movement of water in soils. It has been found that this is due to the curvature of the water surface between the grains of soil. In fine-grained clay soils and in dry soils generally the curvature of the surface of the water between the grains is very great. On account of the great curvature of the surface there is a pressure outward, and a tendency for water to be drawn into the spaces between the grains from any other part of the soil where there is more water and where the curvature of the surface of the water between the grains is less. This is the practical cause of the capillary movement of water in soils, upon which plants depend for their current supply. Methods of cultivation and of fertilization have an influence on this, and investigations will be continued along these lines to see the extent of the influence of tillage upon the movement of the moisture in the soil.

DIVISION OF FORESTRY.

There is one economic question closely related to the general welfare of our future rather than our present which, I fear, has not received adequate attention by our people or by Congress—the forestry question.

It has become apparent that sooner or later a large line of manufacturing industries employing at present capital to the amount of more than one billion of dollars, employing labor of more than one million workers, and producing nearly $2,000,000,000 of value annually, will be more or less hampered for lack of suitable supplies because of the absence of rational use and systematic reproduction of our forest resources. In addition, our agricultural interests in the hill country and mountain districts are bound to suffer, indeed are beginning to suffer from the same cause, just as they have suffered in other countries.

NEED FOR EXTENSION OF FORESTRY INVESTIGATIONS.

The Department of Agriculture, through the Division of Forestry, has with scanty appropriations endeavored to secure and disseminate technical information needful in rational forest management. It has also experimented on methods of tree planting with a view to an extension of forest areas into the forestless regions which need the shelter and protection of forest growth, and has increased our knowledge of the properties of our timbers which might lead to desirable economies in the future.

A more liberal consideration of this line of work by the Government would seem justified by the magnitude of the interests involved, especially since with the establishment of forest reservations from the public domain the need of technical knowledge in their management has become a necessity.

It is well known that the agriculture of the far West is directly dependent upon irrigation, the water of which is secured from the forest-covered mountains. One of the chief purposes which the reservations were designed to serve is the protection of this water supply.

OFFICE OF EXPERIMENT STATIONS.

The agricultural experiment stations, now in operation in every State and Territory except Alaska, continue to carry on a large amount of scientific and practical work giving results of great value to American agriculture. They enjoy more largely than ever the support and confidence of farmers and horticulturists. A number of the States have liberally supplemented the funds appropriated by Congress for the maintenance of the experiment stations. During the past year the revenues of the stations aggregated more than a million dollars, of which $720,000 was received under the act of Congress of March 2, 1887.

URGENT DEMANDS UPON EXPERIMENT STATIONS.

No country equals the United States in the liberality with which it maintains institutions for agricultural research and in the thoroughness with which the results of their work are disseminated among the people in whose interests they were established. So great has been the success of our stations and so urgent have been the demands for the information which they are able to give, that the calls upon station officers for the preparation of popular bulletins and the delivery of addresses at farmers' meetings have in many cases been more than it was possible for them to meet without endangering the success of the original investigations which it was their first business to conduct.

DIFFICULTIES IN STATE STATION WORK.

While the farmers of the country may well congratulate themselves on having such numerous and important agencies for the discovery of new truths and the dissemination of useful information regarding the practice of their art, they should not relax their efforts to aid the stations in advancing the efficiency of their work and securing the greatest benefits to agriculture which can be obtained with the resources at their command. Many of our experiment stations are doing all that could reasonably be expected of them with the means and facilities at their command, but in some cases, as the investigations made by this Department have shown, the stations are hindered in their work [illegible] which might easily be removed. Some of the difficulties [illegible] the station [illegible] or grow out of the fact that the people are [illegible] ent[illegible] [illegible]r interests in this matter to insist that the [illegible] [illegible]ned in accordance with a consistent and [illegible] [illegible]s that thorough agricultural investi- [illegible] [illegible]ns and personnel of the station are

being constantly shifted. This fundamental fact has been too frequently overlooked by appointing officers and boards of control. Fitness and ability to carry on successful investigations should be the fundamental qualifications for station officers, and when competent men are once obtained, they should be made secure in their positions and supported in their efforts to plan and carry out thorough experiments.

PROPER USE OF EXPERIMENT STATION FUNDS.

The funds appropriated by Congress for the experiment stations are intended solely for the carrying on of agricultural investigations and the publication of the results. The stations are by law made departments of the land-grant colleges, but it was not intended that any part of the station funds should be used for the payment of the salaries of the teaching force or for any other general college purposes, nor that the expenses attendant upon the management of farms or dairies for other than experimental purposes should devolve upon the stations. It is evident that in some cases the college has encroached upon the station, and there is still need of greater care in this matter. It is the duty of all institutions receiving the benefits of the land-grant and Morrill acts to make ample provision for the maintenance of the courses in agriculture without in any way diminishing or diverting the funds which should be devoted to the experiment stations.

The stations should confine their operations to such lands and herds as are actually required for the carrying on of experimental inquiries in a few lines determined upon as best adapted to promote the interests of agriculture in their respective States.

EXPERIMENTS FOR ALASKA.

Recent events have greatly augmented the importance of active measures to develop the agriculture of Alaska. The information recently received from unofficial sources, as well as that previously gathered by officers of the Government, seems to make it clear that it will be practicable to develop the agriculture of that region so that it may furnish food supplies and beasts of burden for a considerable population. The development of agriculture in this region, as elsewhere, can undoubtedly be greatly promoted by experimental inquiries conducted systematically under the supervision of expert officers. I would therefore urge that the appropriation for investigating the agricultural resources and capabilities of Alaska be continued and that provision be made for carrying on experiments in that region in case the official inquiries now in progress there seem to make this desirable.

WORK OF THE ALASKA COMMISSION.

In obedience to an act of Congress, a commission consisting of Mr. Benton Killin, a member of the board of regents of the Oregon Agricultural College, and a man thoroughly familiar with the agricultural

conditions on the Pacific Coast, and Dr. W. H. Evans, botanical expert of the Office of Experiment Stations, was dispatched to visit the coast and island region of Alaska from its southern boundary as far north as Unalaska. They were instructed to observe the agricultural conditions existing in places visited, the possibilities of further extensions of arable land, and the native plants used for food and forage; to make collections of soils, and of food and forage plants, and to determine as far as practicable what localities are suitable for experiments in agriculture and what kind of experiments seem immediately feasible and desirable.

This commission started for Alaska about the 1st of June, and brief preliminary reports thus far received indicate that it is successfully prosecuting its work. It is definitely expected that a report of its findings can be prepared so as to be transmitted to Congress during its coming session. Through the courtesy of the honorable Secretary of the Interior and the Commissioner of Education, the services of Dr. Sheldon Jackson, superintendent of Government schools in Alaska, were secured to investigate the agricultural capabilities of the Yukon Valley. Dr. Jackson is to perform this service in connection with the annual inspection of the Alaska schools, in which he is now engaged, and his report may be expected at the same time as that of the commission.

BOTANICAL INVESTIGATIONS.

At least $6,000,000 is paid annually to foreign countries for miscellaneous agricultural plant products which are grown in a temperate climate. A systematic attempt has been begun to give our farmers full information how to grow such products and where to sell them. Many of these small crops should prove valuable additions to the resources of our farming people, especially in sections where there is an overproduction of staple crops, or where farm labor is cheap. The success of similar enterprises in the past demonstrates that they may be made into profitable local industries, and a rational prosecution of this line of investigation is expected to show that in a country of such varied climatic conditions we can match the requirements of almost any cultivated plant of the temperate zone.

INQUIRIES FOR NEW CROPS.

[illegible] number of letters received by the Depart- [illegible] show [illegible] cultivation [illegible] few or little [illegible] farme[illegible] [illegible] view of the [illegible] follow any [illegible] this direction. As [illegible] investigation has [illegible] this country [illegible] minimum, which is [illegible] there is now every pros- [illegible] product in the United

States and that this amount of money will go into the pockets of American instead of European farmers.

In connection with seed distribution two important series of experiments are in progress. First, a practical test of scientific purity and vitality by which the high quality of all the seeds sent out is assured, and second, a field test of the new varieties offered to the Department by which their value and standing as new and important introductions into agriculture may be definitely ascertained before large purchases are made.

DIVISION OF POMOLOGY.

The correspondence which devolves upon this division in relation to the adaptability of varieties for planting, methods of propagation, planting, pruning, and cultivating fruit trees and plants and marketing their product consumes a large portion of the time of the Pomologist or his assistant and prevents much work of original investigation in relation to the fruit industry which is highly important. A large part of this correspondence grows out of the receipt of specimen fruits sent by growers for examination or identification, and its value to the fruit growers of the country is recognized. Provision should therefore be made for its continuance without encroachment upon work which is more strictly scientific and progressive.

Descriptions of more than 550 fruits have been added to the files of the division during the year and 175 water-color paintings, 100 photographic negatives, and about 200 wax models of fruits have been made.

EXPERIMENTS WITH FIGS.

Large sets of fig cuttings from the collection furnished to this Department in 1894 by the Royal Horticultural Society of England have been placed in 10 of the Southern States for testing. Small trees of "Corsican" citron have been placed with more than 100 fruit growers in California and Florida, and 350 seedling trees of Chinese persimmon, grown from seeds obtained from Peking, were distributed to growers who gave them a careful test. Scions of 18 varieties of apples of New Zealand and Australian origin, received through the kindness of the Pomologist of New Zealand, were distributed in June, 1897, to a number of growers for testing. Seeds of the "rough lemon" of Jamaica, valued in that island as a stock for orange trees, were also distributed.

Work on the Descriptive Card Catalogue of Fruits has been continued during the year, and the usefulness of the catalogue as a work of reference has been fully demonstrated.

TEST OF METHODS OF ROOT GRAFTING.

The nursery period of a comparative test of methods of root grafting the apple was completed during the year. The trees resulting from it were distributed to experiment stations and private planters in several States, where they can be kept under observation during the

orchard period, to determine the effect of the methods of propagation upon vigor, productiveness, and longevity.

In addition to work already under way, it is important that a systematic effort in the preparing of maps which will show the areas where the principal fruits grown in the country are capable of being commercially produced shall be begun, and that certain fruit-producing species, which are believed to be adapted to cultivation here, either as stocks or for their fruit, shall be introduced from foreign countries.

PUBLICATIONS.

By the organic law creating the Department of Agriculture one of the chief duties of the Department was defined to be to "diffuse among the people of the United States useful information on subjects connected with agriculture in the most general and comprehensive sense of the word." It is evident that to realize to the fullest extent the benefit of the continued and diligent research and investigation of the scientific questions affecting agriculture, which occupy the time of a large portion of the officers and employees, the information thus obtained must be promptly and widely diffused, and it is my earnest desire to fully comply with the law in this regard.

INADEQUACY OF PUBLICATIONS FOR GROWING DEMAND.

The publication work of the Department has attained extraordinary proportions. The number of publications issued during the past fiscal year is 424, aggregating over six and a half million copies. This is over 100 per cent more publications and over 100 per cent more copies than were issued in 1894, and yet, notwithstanding great improvements in the method of distribution by avoiding duplication and by placing the various publications, as far as possible, in the hands of those only by whom they are chiefly needed, the increased supply is found quite inadequate to meet the increased demand. Thousands upon thousands of persons earnestly desirous of procuring the information these publications are designed to convey have to remain ungratified. The growing demand for the publications of this Department is strikingly manifested in two important particulars—on the one hand by the large sale of the Department publications by the Superintendent of Documents, under the provisions of the law providing for the printing and binding, approved January 12, 1895, the number of publications of this Department so sold amounting to [illegible],000, an increase over the year previous of more than 10,000; on the other hand by the increased demand by Members of Congress for [illegible]ications of this Department to distribute to their constituents.

[illegible] DISTRIBUTED.

[illegible] publications issued by the [illegible] ending June 30, 1897, and amount-

ing to over 23 millions, over 6½ millions have been turned over to Senators, Representatives, and Delegates in Congress for distribution by them; and of this vast number, 5½ millions were so turned over in the past three years and nearly 2½ millions of that number, or about 45 per cent, during the last fiscal year.

Number of publications issued during five years ending June 30, 1897.

Year.	Publications.	Farmers' bulletins.	Total copies issued.	Distributed to Members of Congress.
1893	210	.....	2,689,084	989,468
1894	205	278,500	3,169,310	
1895	254	1,567,000	4,100,660	1,385,770
1896	376	1,891,000	6,561,700	1,816,695
1897	424	2,387,000	6,541,210	2,467,237
Total	1,469	6,123,500	23,061,964	6,659,170

CALL FOR AN INCREASE OF APPROPRIATION.

With the exception of the sum allowed for the printing and distribution of Farmers' Bulletins, there has not only been no increase in the total appropriations for the Division of Publications during the period of five years covered in the foregoing table, but the amount available is actually less now than then, notwithstanding the fact that between the first and last years of that period the number of publications issued was more than double and the total number of copies issued had increased by nearly 4,000,000. A large amount of extra work—that is, work performed outside of the usual office hours—has therefore devolved upon the division force; while, in order promptly to distribute the enormously increased number of publications without any adequate provision for an increase in the force, it has been necessary to constantly draw upon the force of other divisions. While this may be justified on the ground that all divisions are interested in this work of the distribution of documents and are served by its efficient performance, it interferes seriously with a systematic arrangement of the clerical force and tends to interrupt the regular work of other divisions. A large increase has therefore been asked for in the appropriation for the work of publication, both of the regular printing fund and also for Farmers' Bulletins and for the distribution of bulletins, reports, and other documents for the ensuing year.

CONGRESSMEN'S QUOTAS OF BULLETINS REDUCED.

The want of adequate appropriations for the current fiscal year has compelled me regretfully to reduce the number of Farmers' Bulletins available for Members of Congress, notwithstanding the continued demands made upon the Department for an increase in this direction. The figures above given, showing the large proportion of publications distributed through Members of Congress and the rapid increase in

the number distributed through this channel in the past three years, afford ample evidence that it is only by greatly enlarging our facilities in this respect that Congress will enable me to supply the urgent demand of its own Members.

DISPOSITION OF FUNDS DERIVED FROM SALE OF DOCUMENTS.

The large increase in the sale of the publications of this Department by the Superintendent of Documents, and the frequent calls made by that officer for additional copies of publications of which his sales have exhausted the supply, suggest that the moneys received by him for the sale of our publications should be made available for the reprinting of such as are thus exhausted, and for which the demand still continues. So far as possible, the Superintendent of Documents has been supplied in such cases with a limited number taken from the small reserve for official use at the Department, authorized under the law of January 12, 1895, and whenever a reprint has become necessary for our own use a certain number of the reprinted copies have been placed at his disposal, but it does not seem right that from a printing fund barely adequate to supply our wants money should be taken to pay for additional copies to be sold by the Superintendent of Documents, and the proceeds handed over to the Treasury. I therefore earnestly recommend that the law of January 12, 1895, providing for the public printing and binding be so amended as to provide for the setting aside of the moneys so received for Department publications, subject to the joint order of the Secretary and the Superintendent of Documents for the reprint of Department publications for sale.

HURTFUL RESTRICTIONS REGARDING PUBLICATIONS.

Other amendments to the law of January 12, 1895, are very urgently needed. The provision under section 89, by which the discretion of the Secretary of Agriculture as to the number of copies of the reports and bulletins he desires to print is restricted to "reports and bulletins containing not to exceed 100 octavo pages," and which limits the editions of all publications exceeding that size to 1,000 copies in any one fiscal year, should be promptly abrogated. This limitation conflicts directly with the organic law creating the Department, providing [illegible] diffusion of the information it acquires for the benefit of agri- [illegible] that respect this Department differs materially from other [illegible] ications are issued largely [illegible] this Department is com- [illegible] ist with many hundred scientific and [illegible] foreign countries, to distribute its publica- [illegible] leges and experiment stations, and to [illegible] institutions and that every division, [illegible] strative work, is obliged to [illegible] correspondents, most valu-

able coadjutors in carrying on our work, but receiving no pay and getting no acknowledgment except in the distribution to them, free of charge, of the publications in which they are specially interested, it will be readily understood that there is not a single publication of this Department of which we do not need more than a thousand copies, even when the circulation thereof is not extended beyond what may be termed official use. Cases have occurred where the number of persons supplying valuable information and responding at the cost of no little time and trouble to circulars of inquiry addressed to them by the Department has largely exceeded 1,000, and these have, therefore, been deprived of the simple courtesy of a copy of the publication to which they had themselves so cheerfully and largely contributed. In nearly every case where this limitation has been imposed upon us the value of the work has occasioned a considerable call upon the Superintendent of Documents from parties perfectly willing to pay for the book, but whom it has, of course, under this embarrassing limitation, been impossible to gratify.

REPRINTS FOR PRIVATE INDIVIDUALS.

One other restriction now imposed under the law of January 12, 1895, should also be withdrawn. This is the limitation prescribed in section 42 of the act in question, which limits the number of copies of any bulletin which the Public Printer may furnish to applicants giving notice before the matter is put to press to "250 to any one applicant." It has frequently happened that the work of the Department in promulgating useful information would have been widely supplemented by various organizations interested and without expense to the Government had this limitation not existed. In other cases a little deception has defeated the purpose of the law, as it is only necessary for a party desiring 1,000 copies to send in four orders under different names for 250 each. It is earnestly to be desired that this limitation should be withdrawn, and that it should be left to the discretion of the Public Printer to decide what number of copies he can supply under certain circumstances, providing the request of the applicant be indorsed by the head of the Department from which the desired publication is issued.

INCREASE DESIRED IN DEPARTMENT QUOTA OF YEARBOOKS.

As far back as 1888, when there were but one bureau and eleven divisions reporting to the head of the Department, then Commissioner of Agriculture, and when only 400,000 copies of the Annual Report were printed, 30,000 copies were set aside for the use of the Department. In 1889 the Department quota was reduced from 30,000 to 25,000, and remained at the latter figure until 1892, when the total number of copies of the Annual Report was increased from 400,000 to 500,000, and the Department quota was restored to the former figure of 30,000. Since that time these figures have remained unchanged.

In the meantime the far more popular form of annual report, viz, the present Yearbook, has been adopted, and the correspondents and coworkers of the Department have greatly increased. The agricultural experiment stations have been established throughout the country with a special officer representing their interests in the Department, whose requisition for Yearbooks to supply the colleges and stations and the specialists engaged therein and corresponding institutions abroad, covers over 1,800 copies of this publication. In place of one bureau we now have two, the added one—the Weather Bureau—calling for over 3,000 Yearbooks to supply its voluntary weather observers alone, and both bureaus having largely increased their sphere of work and the number of their correspondents. In place of eleven divisions reporting directly to the head of the Department there are now eighteen, and one of these alone, namely, the Division of Statistics, has quadrupled the number of its correspondents. The foreign exchange list of the Department has also more than doubled since 1888. Under these circumstances, I am compelled to recommend most urgently that the Department quota of the Yearbook be increased to 50,000 copies, at least.

DIVISION OF STATISTICS.

The preparation of monthly reports concerning the condition, acreage, and production of certain products of the soil and the number and value of farm animals has been the principal work of this division during the year. These reports have been based on returns received from a corps of 56,700 regular correspondents, reporting monthly, and 140,500 special correspondents, reporting at particular seasons of the year.

In addition to the monthly crop reports, the number of copies of which ranged during the year from 172,500 to 200,000 per month, special reports to the number of 325,000 copies were also published.

IMPROVEMENT IN CROP REPORTING.

I am impressed with the extreme cumbrousness of the system of crop reporting that has been in use in this division during the last few years. Instead of conducing to completeness and accuracy, it would appear from the report of the Statistician to in some measure defeat its own object by its unwieldiness and by the fact that the indefinite multiplication of crop reporters weakens the sense of indi- [illegible] responsibility. I strongly favor the making of some slight [illegible] acknowledgment of the services of a carefully selected corps of correspondents [illegible] located mainly in the principal agricultural states, and tha[illegible] [illegible] placed upon the State statistical agents [illegible] informa[illegible] [illegible] states of minor agricultural importance.

[illegible] [illegible]ical concentration of agricultural pro- [illegible] United States that 25 States, or just half the total [illegible] of the cotton, 95 per cent of the corn,

95 per cent of the barley, 93 per cent of the oats, and from eight-tenths to nine-tenths of the wheat, rye, buckwheat, tobacco, potatoes, and hay produced in the entire country.

NEED OF QUALIFIED AGENTS IN EVERY STATE.

It is clear, therefore, that the making of satisfactory provision for crop reporting in twenty-five States would leave only a very small part of the total production of the principal crops to be reported upon exclusively by State agents.

That the Department should have a principal statistical agent in each State in place of the present unsatisfactory plan of State groupings is, it seems to me, an obvious requirement. It has been the rule of the Department until within the last two or three years to have a separate statistical agent in each State, in order that it might have the advantage of his superior local knowledge. The Department's increased dependence upon these officers renders it doubly important that they should possess all the qualifications necessary to the proper performance of the duties required of them, and unless the best men are selected the Department's crop-reporting system will be weakened instead of strengthened by their appointment.

DISTRIBUTION OF CROP REPORTS.

In this, as in every other branch of the work of the Department, the question how the farmer may be made to receive greater benefit than heretofore from the collection of information designed primarily for his use is being carefully considered. The printing and distribution of the monthly crop reports have been considerably expedited within the last three months, and it is hoped that within a short time they will reach the farmer still more promptly.

As a further means of placing him in possession of important information at the earliest possible moment, it is suggested that brief reports as to the general condition of crops and the state of the markets at home and abroad may be displayed in rural post-offices. It has been ascertained that this can be done at a very small expense, and such an arrangement is in contemplation.

ACCOUNTS AND DISBURSEMENTS.

Including the sum of $720,000 for agricultural experiment stations, Congress appropriated to the Department of Agriculture for the fiscal year ending June 30, 1897, $3,168,532.

While the appropriation for the agricultural experiment stations is included in the act making appropriations for the Department, the money is paid quarterly directly to the 48 experiment stations, as provided by the act approved March 2, 1887. The expenditures from this fund are, therefore, not considered in the following statement of Department expenses.

Of the amount appropriated for the fiscal year 1897, $2,146,044.23 was disbursed prior to July 1, 1897. There remained on that date unpaid bills aggregating $184,000. When these shall have been paid the total expenditures from the appropriations for the year 1897 will be, in round numbers, $2,330,000, leaving a final balance to return to the Treasury of about $118,000. The total amount paid out during the year was $2,306,365.36, including $1,488.10 for supplemental accounts of 1895 and $159,836.57 for those of 1896.

CONCLUSION.

This brief summary of the work of the Department will give producers an outline of the comprehensive scope of its efforts to help observers and investigators where ways and means for prosecuting research into nature's unknown secrets are beyond their reach. It is in sympathy with the colleges and experiment stations endowed by Congress, endeavoring to help and encourage, while avoiding all appearance of dictation or meddling. The Department is now the most comprehensive repository of scientific facts regarding agriculture in all its relations to mankind, and a publisher of this kind of information more extensive than is found anywhere else. The work of the Department grows with the diversification of production and manufacturing on the farm; as the extension of commerce by improved and cheapened transportation brings our people into competition with new countries and new conditions; as the magnitude of our crops, seeking new markets, increases and our flocks and herds multiply and enter into home and foreign commerce. It advocates the interests of the American farmers when their exports are discriminated against in foreign countries, and endeavors to serve them from a national standpoint whenever occasion requires or opportunity presents.

The time is auspicious for pushing the work of the Department of Agriculture. The people's President, now executing the laws of the Republic and guiding its policies, sympathizes with those who toil in the field, the factory, the forest, and the mine. He is solicitous that the Department become useful to all sections of our country, to the end that the greatest possible assistance may be given rural home makers.

[illegible]m glad to testify that the spirit of improvement and progress is [illegible] general among Ame[illegible]an farmers than ever before; that the necessit[illegible] [illegible]ation [illegible]es pertaining to economic production [illegible] the farmer's home is becoming more [illegible] of intelligence, virtue, and [illegible]dions, and the sure [illegible]

[illegible] WILSON,
Secretary.

REPORT OF THE CHIEF OF THE DIVISION OF CHEMISTRY.

U. S. DEPARTMENT OF AGRICULTURE,
DIVISION OF CHEMISTRY,
Washington, D. C., August 31, 1897.

SIR: I have the honor to submit herewith for your consideration the executive report of the Chemical Division for the fiscal year ended June 30, 1897.

Respectfully,

H. W. WILEY, *Chief.*

Hon. JAMES WILSON, *Secretary.*

WORK OF THE YEAR.

The character of the work carried on in the Chemical Division of the Department of Agriculture during the fiscal year ended June 30, 1897, is shown in the following summary.

STUDY OF TYPICAL SOILS.

The value of the study of the typical soils of the United States has been enhanced by securing from the celebrated experiment station at Rothamsted samples of a few of the soils whose history has been carefully noted at that station during the past fifty years. These samples were kindly furnished by Sir J. Henry Gilbert, who, in conjunction with Sir John Bennett Lawes, has had charge of the experimental work at that station for the past sixty years.

A direct comparison has been instituted between these soils, whose history has been known for so long a period, and the typical soils which have been secured from various parts of this country.

The character of the work has not varied greatly from that of previous years, but some important changes in the details have been instituted. During the previous years the amount of moisture in the soil at any given time was determined chiefly by an inspection of the surface, with occasional weighing of the pot. This method, under constant supervision of an expert, is capable of securing the best results. Often, however, it happens that this supervision of the work, which has been under the immediate direction of the chief of the division, is interrupted by reason of his absence. In such a case it has been deemed advantageous to have a more rigid control of the quantity of moisture present. To this end weekly weighings of the pots have been made, so that the quantity of moisture which has been evaporated during the seven days is directly determined. Knowing the quantity necessary to produce complete saturation of the soil, a simple calculation will show the amount to be added in order that the amount of moisture in the soil shall be between 60 and 70 per cent of the total quantity necessary for its complete saturation.

The method of weighing has been improved by an ingenious mechanical device which renders it possible for one person, without assistance and without undue physical exertion in the way of lifting the pots, to weigh the whole number, viz, 176, in about four hours.

Important improvements in the method of applying the moisture have also been inaugurated, which have been the result of the experience of the past few years. The use of glass measuring vessels has been discarded, and a large number of tin vessels of conical shape, holding 2 pounds of distilled water, have been employed. By these improved means it is quite possible to add one portion of water to each of the pots in the course of two hours.

The general control of the crops growing on these soils has been continued as in previous years. Oats and beans are grown during the first half of the season in duplicate samples of typical soils. After the harvest of these crops the soil in the pots is again prepared for planting and a crop of buckwheat grown thereon. By this method two crops are secured during each season, thus increasing the value of the experimental work by duplicating the data obtained.

A careful study is made of the total amount of dry matter produced in each pot and the quantity of nitrogen, phosphoric acid, and potash removed from the soil by each crop is determined. The data of four seasons are now at hand and, while it is not claimed that these data are sufficient to establish all the points in question, they are at least sufficiently extended to warrant the preparation of a preliminary report, which is now under way. This report will contain statements in regard to the composition of the soils, their physical character, their water-holding capacity, their content of humus, and the percentages of nitrogen, phosphoric acid, and potash contained therein, both as regards total content and in respect of the quantities removed by different solvents.

These data will be illustrated not only by analytical tables but also graphically in such a way as to show in the most evident manner the relation which exists between the physical and chemical composition of the soil, its content of moisture, and the quantity of dry organic matter produced.

STUDY OF FOODS.

The principal part of the work in the investigation of foods during the fiscal year has been devoted to a study of cereal products. This study has naturally followed that of the previous year on the composition of the cereals themselves. In the study of the cereal products the direct products of milling have received first consideration. The composition of different varieties of flour and meal and of the by-products of milling has been carefully established by elaborate chemical investigations.

To the ordinary chemical work has been added a study of the calorific power of the different products as determined by the direct combustion in oxygen. Valuable data in regard to the heat-giving properties of foods have thus been secured, and it has also been ascertained that the combustion is a valuable check upon the accuracy of [illegible] chemical analyses. When the calorific power of the principal constituents of foods, viz, proteid matters, starch, and fats, has been determined it follows that the calorific power of a cereal can be deter- [illegible] the analytical data provided they have been accurately [illegible] found that the calculated calories [illegible] determined calo-

ries by direct combustion, it is evident that an error has been committed, either in the analysis or in the combustion. In that case a repetition of the analysis or the combustion is usually required to discover the source of the error and permit of its correction.

The work of investigating these food products has been particularly complicated. It has covered the whole range of flours, meals, milling by-products of every description, biscuits, cakes, and prepared cereal foods. The analytical data and comments thereon have been prepared in manuscript form and will soon be ready for transmission to the printing office. This work will complete the systematic investigation which has been carried on so long by this Division, beginning in 1883 with a study of the cereal products in the United States and continued without intermission up to the present time. The amount of analytical labor which has been executed in this work has been very great and the success which has attended it has been due largely to the industry and application of the analysts engaged therein.

COOPERATION OF THE ASSOCIATION OF OFFICIAL AGRICULTURAL CHEMISTS.

The excellent results which have been obtained by the active cooperation of this Department with the Association of Official Agricultural Chemists have been recognized and acknowledged in all quarters of the world. Especially in the United States have these results been of inestimable value in unifying and coordinating the methods of analyses employed in the various experiment stations and other laboratories of the country. A comparison of the methods of procedure at the present time with those which were in vogue fifteen years ago would serve as an unanswerable argument in favor of the continuation of the cooperation which has been so harmoniously established and maintained.

In the active work incident to this cooperation the Chemical Division has taken a prominent part. All of the subjects which are assigned for investigation by the Association of Official Agricultural Chemists are fully and patiently studied by the chemists of the Department. The contributions which have been made in this way from the Division of Chemistry have done much to secure the high standard of analytical work which now obtains in the United States among our agricultural chemists. So firmly has this standard been established and so excellent have been its merits that it has commanded the approval and support of commercial chemists and those engaged in original investigations.

At the Second International Congress of Applied Chemistry, which was held at Paris at the beginning of the fiscal year mentioned, the bulletins containing the methods of analysis of the Association of Official Agricultural Chemists were officially recognized, and it was voted to make them a part of a comparative study of international methods which was inaugurated by this Congress. The Department of Agriculture has, through its cooperation with the Association of Official Agricultural Chemists, inaugurated a movement which it is believed will soon be consummated in an international agreement covering all points of analytical operations in agricultural chemistry.

MISCELLANEOUS.

The miscellaneous work of the Chemical Division has been, as in previous years, of a varied character. One of the chief items in this

class of work during the fiscal year has been the recommencement of the investigation of sugar-producing plants in the United States. The possibility of the establishment of an indigenous sugar industry was pointed out by this division as long ago as 1884. During the past four years the active participation of the Department of Agriculture in this work has been suspended. The recommencement of these investigations has been recognized with peculiar pleasure by the farmers and capitalists who have been striving to establish the beet-sugar industry in the United States. The work of investigation has been undertaken practically at the point where it was left in 1894.

The chief immediate object of the work is the establishment of stations for the growth and improvement of the sugar beet, with the object of establishing in this country farms for the production of beet seed of high grade. It has already been established by our investigations that domestic seeds produce a hardier plant and a larger percentage of sugar than seeds of foreign origin. The great importance, therefore, of the growth of indigenous seeds is at once apparent. It is the object of the Chemical Division to establish, by chemical analysis, the right beet to serve for the production of seed, and to plant for the production of seed only those beets which, by chemical analysis, have shown sugar-producing properties of an exceptional character.

PROPOSED WORK FOR THE FISCAL YEAR ENDING JUNE 30, 1899.

By reason of the restricted appropriations afforded the Chemical Division for the fiscal year ending June 30, 1898, it will not be possible to extend the scope of investigations much beyond the plan followed in the previous fiscal year. The investigation of foods will be continued, the special subject under consideration being the composition and character of infants' and invalids' foods. This subject is of such a wide scope that it will be all the work which it will be possible to do in this line during the year.

The work in the typical soils of the United States will be continued along the lines already followed for the purpose, either of ascertaining new facts in regard to the relation of soil to crop, of confirming the results of investigations already made, or of correcting them in order to make them conform to the new discoveries which may be made.

The work in the investigation of sugar-producing plants contemplates the analysis of samples grown by farmers in different parts of the country from seeds furnished by the Department. From arrangements which have already been made by these farmers, it is indicated that 5,000 or 6,000 samples of beets will be sent to the Department for analysis during the months of September, October, and November. [illegible] preparations have been made for the accomplishment of a large amount [illegible] work [illegible] and it is hoped that valuable information may be [illegible] regard to the quality of soil and climate in different [illegible] can be produced with a high content of sugar [illegible] study of t[illegible] [illegible]ion of beets grown from high-grade seeds [illegible] the Chemical [illegible]sion, will also be conducted [illegible] the experiment stations o[illegible] [illegible] range of climati[illegible] [illegible] also proposed to con[illegible] [illegible]dertaken, not concluded [illegible] [illegible]reals and other

starch-containing plants. This is one of the most difficult operations in analytical agricultural chemistry, and has been the subject of wide discussion in all parts of the world.

An investigation of the disposition which is made of street sweepings and other refuse of cities has been undertaken by this division and will be prosecuted vigorously during the coming year. The division has placed itself in communication with all the cities of the United States having a population of 10,000 and over. It has also perfected arrangements for obtaining information in regard to disposition of street sweepings and sewage in the largest cities of Europe. The importance of this work is twofold. First, from a hygienic and economic point of view, in regard to the best method of disposing of this refuse, and second, from a manurial point of view, in regard to the value of these materials for fertilizing purposes. In cases where garbage and street sweepings are burned a study of the resulting ashes will be made for the purpose of determining their fertilizing value. It is hoped that a material advantage will accrue from this investigation, both to the cities, in respect of the method of disposing of the refuse, and to the farmers, in respect of securing a new fertilizing material at a low price.

REPORT OF THE CHIEF OF THE DIVISION OF VEGETABLE PHYSIOLOGY AND PATHOLOGY.

U. S. DEPARTMENT OF AGRICULTURE,
DIVISION OF VEGETABLE PHYSIOLOGY AND PATHOLOGY,
Washington, D. C., September 1, 1897.

SIR: I have the honor to submit herewith a report reviewing the work of this division for the fiscal year ending June 30, 1897, and outlining the investigations planned for the current fiscal year.

Respectfully,

B. T. GALLOWAY, *Chief.*

Hon. JAMES WILSON, *Secretary.*

WORK OF THE YEAR.

The principal work carried on during the year may be discussed under the following heads:

(1) Investigations of the diseases of forest and shade trees.
(2) Diseases affecting plants under glass.
(3) Studies of the diseases of melons and of cotton and other Southern crops.
(4) The diseases of pomaceous and allied fruits.
(5) Investigations of the diseases affecting fruits and other crops on the Pacific Coast.
(6) Work in Florida on citrous fruits and other subtropical plants.
(7) Cereals and cereal diseases.
(8) Experiments with fungicides.
(9) The nutrition of plants.
(10) Preparation and preservation of pathological specimens for permanent use.
(11) Preparation of an exhibit for the Tennessee Centennial Exposition.
(12) Bibliographic work.
(13) Preparation and publication of bulletins and papers.
(14) Correspondence.

INVESTIGATIONS OF THE DISEASES OF FOREST AND SHADE TREES.

The work on the diseases affecting forest and shade trees, outlined in my last report, was carried forward as rapidly as limited time would permit. The investigations were for the most part confined to shade and ornamental trees growing on city streets and in parks. As regards the diseases affecting forest trees, all that could be done was to collect data which might prove useful at some future time when

opportunity for more extended work is available. A paper on the more important diseases of shade and ornamental trees was prepared and published in the Yearbook for 1896.

DISEASES AFFECTING PLANTS UNDER GLASS.

Considerable time was given to the diseases affecting plants grown in greenhouses. The forcing of vegetables and flowers under glass is rapidly becoming an important industry in this country. Hundreds of acres of glass are devoted to the work, and the value of the yields range from 25 cents to $1 or more per square foot. It is evident that where every inch of space must be utilized and the work carried on in the most intensive way diseases when once started are likely to occasion great loss. Nearly all the serious troubles are intimately associated with food supply, light, heat, water, soil, etc., and therefore in order to arrive at an intelligent understanding of the nature of many of the diseases these questions must receive attention.

A disease of the Bermuda or Easter lily, which for a number of seasons has destroyed from 20 to 60 per cent of the crop planted here for forcing, received considerable attention. The bulbs are grown in Bermuda and are harvested and shipped here in July and August, to be forced by florists the following winter. Partly owing to the way the bulbs are propagated and grown in Bermuda, and partly as a result of improper methods of handling, only about 50 per cent of those actually planted ever make salable plants. The work has shown that much of the trouble can be overcome by exercising care in the methods of culture and by attention to details in selecting and handling the bulbs. The investigations have further shown the possibility of growing the bulbs in this country. If this could be brought about it would open up a new and important industry, and at the same time make it possible to develop the vigor of the plants to much better advantage than can be done under the present methods of growing the crop. A bulletin setting forth the main facts in regard to the disease and the methods of treatment was prepared and is now in the hands of the printer.

In connection with the work on the lily disease, considerable time was given to the investigation of several serious troubles of the carnation. A disease known as "bacteriosis" received special attention, with the result, it is believed, of obtaining facts leading to a better knowledge of its cause and treatment. Diseases of other crops, such as the rose, violet, and chrysanthemum, were also studied, but the facts obtained do not warrant any definite statements in regard to them at this time.

[illegible] BELONG [illegible] COTTON AND OTHER [illegible]

[illegible] cleared to [illegible] possible to [illegible] ut it. Work [illegible] tin[illegible] and [illegible] inued. The [illegible] close[illegible] for[illegible]ing the [illegible] a knowl[illegible] in [illegible] suggest- [illegible] measu[illegible] diseases of the cab- [illegible] ps were also investi- [illegible] improved methods

of making culture media and a number of facts which will greatly facilitate future laboratory work were discovered.

THE DISEASES OF POMACEOUS AND ALLIED FRUITS.

As heretofore, the time of one assistant was devoted almost exclusively to a study of the diseases of the apple, pear, quince, and other pomaceous fruits. As a result of further investigations of pear blight, confined mainly to the laboratory, a prompt and easy method of determining whether suspected trees are or are not affected with this disease was found. This is often an important matter, especially in cases where it is necessary to take steps for the eradication of the malady. Work was also inaugurated to test the effects of different methods of feeding, pruning, bud and cutting selection, etc., on the growth of the trees, especially in their relation to certain diseases.

INVESTIGATIONS OF THE DISEASES AFFECTING FRUITS AND OTHER CROPS ON THE PACIFIC COAST.

During the year the work on the Pacific Coast was marked by valuable results to the fruit growers of that section. Peach leaf curl, which has been referred to in former reports, was very successfully combated. Extensive experiments were made with a view of obtaining further facts as to the most practical means of treating this disease. As a result of this work and the recommendations based upon it the evidence is conclusive that at least half a million dollars' worth of fruit was saved in California alone during the year.

The growing of the English walnut in California is rapidly becoming an important industry. Recently this crop has been attacked by a serious disease which in many sections threatens to greatly reduce the yield. The disease is bacterial, and careful studies of the organism have been made, with a view of discovering the best methods of combating it. The work on the treatment of the disease involved the spraying of nearly forty acres of trees of all ages. The results showed that the yield of nuts was about doubled where trees were treated. In addition to the work with the usual fungicides, a large series of experiments were made with corrosive sublimate to test its effectiveness as a means of checking the disease. This was the first attempt, so far as known, to test the substance on an extensive scale under conditions which prevail in the orchard.

A large part of the time of the assistant in charge of the work on the Pacific Coast is necessarily taken up in purely routine matters, such as correspondence, examination of material sent in, etc., and as a result he has little time to get material in shape for publication. He has now on hand sufficient data to warrant the publication of papers on the following subjects: (1) The apple canker of Oregon and Washington, one of the most serious diseases known on the coast; (2) fig fermentation, a disease of the fig which largely limits the culture of this fruit in California and elsewhere on the coast; (3) black rot of the navel orange, a fungous disease which destroys from 4 to 10 per cent of the navel oranges in some of the better orange-growing sections; (4) coulure of raisin grapes, a trouble attacking the best raisin vines and causing a loss of several hundred thousand dollars to the vine growers of California and Arizona nearly every season; (5) the crossing of grapes, being an account of observations and methods in this line of work; (6) walnut bacteriosis, a new and serious bacterial disease of the Persian or English walnut; (7) peach-leaf curl, including the results of widely

extended experiments in the prevention of this disease; and (8) gum diseases of stone and citrus fruits, being facts accumulated relative to these troubles during several years of observation and study of the conditions under which they develop.

WORK IN FLORIDA ON CITRUS FRUITS AND OTHER SUBTROPICAL PLANTS.

Of the diseases of citrus fruits studied during the year in Florida, sooty mold, blight, die-back, and foot rot received special attention. Considerable time was also given to an investigation of several fungous parasites which attack the white fly, an insect associated with the sooty mold fungus. It was believed that the fungous parasites of the white fly might be utilized in a practical way in destroying the insect and at the same time making it impossible for the sooty mold to develop. This work, so far as it was carried on, gave promise of good results. Some of the facts in regard to the matter are given in a bulletin on sooty mold of the orange and its treatment issued during the year. In addition to the work on citrus fruits, considerable time was devoted to the diseases of pineapples, guavas, and other crops. The seedling oranges, resulting from crosses made in previous seasons, were budded, so far as they were large enough to yield bud wood, on old stocks, with a view of forcing them to bear more quickly than they would if left on their own roots. In addition, many new crosses were made. Nearly 600 flowers of various citrus fruits were cross pollinated in the spring of 1897 at Eustis, Fla., and about 300 flowers at Braidentown, Fla., on the Manatee River. Of the Eustis crosses, some 50 flowers set fruit which promises to come to maturity. In the experiments made this year special attention was paid to securing crosses likely to be immune from blight, scab, mal di gomma, and other serious maladies. Many crosses were made in the hope of securing varieties better capable of withstanding cold than those now grown. The deciduous *Citrus trifoliata* is hardy as far north as Philadelphia, and if a hybrid could be obtained possessing its deciduous habit and extreme earliness, together with the high flavor and large size of fruit characteristic of the ordinary orange, its value would be very great indeed.

Encouraged by the successful outcome of an experiment made two years ago in cross pollinating the pineapple, a large number of crosses were made during the year, and as a result over 1,500 seeds have been obtained, which are likely to yield many new varieties. As in the hybridization of citrus fruits, special efforts were made to secure new varieties immune from ripe rot, spike, blight, and other destructive diseases. It is confidently believed that most of the maladies affecting pineapples can be prevented with ease and certainty by breeding resistant sorts and exercising rigid care in the selection of slips for planting.

The guava, probably the most widely known and best appreciated of the strictly tropical fruits in Florida, has been made the subject of extensive selection experiments [illegible] view of securing sorts freer from seeds, larger, and of bette[illegible] as a result of these tests [illegible] seedlings are at present [illegible]

[illegible] resist-
[illegible] he diseases [illegible] n fa[illegible] u regard to their

value for the different wheat-producing regions of the country, were continued at Manhattan, Kans., in cooperation with the State experiment station. About 300 varieties were planted, but only 60 survived the unusually severe winter. The three years' test of varieties under severe conditions has shown with considerable certainty which are best adapted to this country and what countries can be drawn upon for new sorts with the greatest prospect of success.

Much time was given to a study of the wheat plant under various conditions of culture in different parts of the world. This work, it is believed, will throw light on the question of the adaptation of varieties to conditions here, a matter that must be considered in the investigation of diseases. In the laboratory studies of the life history of a number of the fungi attacking cereals and other plants was continued, special attention being given to the various rusts on grasses and their relation to those occurring on wheat and other cereals.

EXPERIMENTS WITH FUNGICIDES.

Further work was carried on with a view of simplifying the preparation and application of a number of fungicides. Special attention was devoted to Bordeaux mixture, both as to improvements in its preparation and the testing of its effects on the growth and productiveness of a number of plants.

THE NUTRITION OF PLANTS.

In connection with the work on the diseases of crops grown under glass, considerable attention was given to the effects of different methods of feeding plants on their growth, productiveness, and susceptibility to disease. Where plants are grown in greenhouses, especially on benches, the question of proper feeding is important. In order that the crops may prove remunerative it is necessary to furnish the maximum amount of food consistent with health, and to do this successfully requires much experience and a thorough knowledge of the local conditions of soil, climate, and other important factors. The work carried on was not intended to obtain facts purely of local interest, but was designed to throw light on certain fundamental principles which would be of general value. The rose was the principal crop upon which experiments were made, the plants and the space for the work being kindly furnished by one of the large growers near Washington.

PREPARATION AND PRESERVATION OF PATHOLOGICAL SPECIMENS FOR PERMANENT USE.

In the course of the work of the division many specimens of diseased plants are received from correspondents, experiment station workers, and others, and some are purchased, especially if they have value from an economic standpoint. Such specimens are preserved in the herbarium and aid materially in arriving at satisfactory conclusions relative to new material. A considerable number of duplicate specimens illustrating plant diseases in different stages have accumulated, and work was commenced during the year with a view of putting these into condition for distribution among the experiment stations. Specimens properly labeled, with appended notes as to their economic importance, would, it is believed, materially aid the stations in their work.

PREPARATION OF AN EXHIBIT FOR THE TENNESSEE CENTENNIAL EXPOSITION.

The time of one assistant for about three months was devoted to the preparation of an exhibit for the Tennessee Centennial Exposition held at Nashville. The exhibit was planned and prepared to illustrate the practical work of the division, and it is believed served a useful purpose as an educational factor.

BIBLIOGRAPHIC WORK.

The bibliographic work, including the indexing and abstracting of important literature on plant pathology and allied subjects, was carried on as far as available time and help would permit, but these being limited progress in some respects was slow.

PREPARATION AND PUBLICATION OF BULLETINS AND PAPERS.

This work occupied considerable time. Six papers for the Yearbook for 1895, two bulletins, and one Farmers' Bulletin were published; five papers for the Yearbook of 1896, two bulletins, and one Farmers' Bulletin were prepared and published, and one bulletin and several papers were prepared and are now ready for publication.

CORRESPONDENCE.

The correspondence of the division occupies a large part of the time of the entire force. About 6,000 letters, including the correspondence of the assistants in Florida and California, were received and answered. Many inquiries require the work of days and sometimes weeks before they can be satisfactorily answered, while some can be answered by sending bulletins or circulars. In the majority of cases, however, letters of explanation are necessary, and although the preparation of so many letters occupies much time, yet it is believed that advantages to be gained through this method of reaching the public fully warrant the trouble.

INVESTIGATIONS PLANNED FOR THE CURRENT YEAR.

A number of the lines of work inaugurated during the fiscal year ending June 30, 1897, will naturally extend into the current year. The work on the diseases of trees will continue to be pushed forward as rapidly as available time and means will permit. A number of problems connected with the relation of climate to tree growth properly come within the scope of this division. The winter killing of trees, especially evergreens, in certain parts of the West is receiving some attention, as are also the injuries which occur during winter where irrigation is practiced. Irrigation is bringing up other problems. [illegible] it is followed many of the crops grown are subject to serious [illegible]s. Asphyxiation [illegible] the roots is common in certain soils, and again, a number of diseases [illegible] parasitic origin are disseminated by irrigating waters. Some [illegible] on has already been given to these [illegible] the year. [illegible] plants under [illegible] the [illegible] investigations of those [illegible] with the work on the [illegible] experiments with a view of [illegible] Bermuda lily [illegible] be grown in

this country. With our wide extent of territory and great variety of soil and climate, it seems probable that a region adapted to the growth of the crop can be found. To obtain the necessary facts in regard to climate, soil, methods of cultivation, etc., Bermuda should be visited, and a careful study made of all the conditions affecting the growth of the bulbs.

The work on several diseases affecting melons will be completed and the results prepared for publication. The work on the diseases of cotton and cowpeas will be continued, and in connection with it investigations will be inaugurated having for their object the obtaining of new light on the organisms producing the root tubercles of clover and other similar crops.

In the work on pomaceous fruits it is planned to make some experiments with a view of determining the best methods of eliminating pear blight from the orchard and nursery. In addition special attention will be given to the decay of ripe fruits during shipment or while in storage.

Of late the peach crop in all sections of the country has suffered severely from rot, and it is planned to conduct a series of experiments during the spring of 1898 in the hope of finding a means of holding this disease in check. The work on peach yellows and peach rosette, which has been suspended for some time, will, if time permits, be renewed along lines suggested by recent improved methods in bacteriological investigations.

On the Pacific Coast the work has been planned to enable the assistant in charge to complete as many of the papers already referred to as possible. It is important that the valuable and practical results obtained in the treatment of a number of the various fruit diseases be placed in the hands of fruit growers as soon as possible. To this end only such new lines will be taken up as are necessary to answer important questions at issue.

Plans have been made and nearly perfected for a material change in the work heretofore carried on in Florida. The assistants in charge of this work have gained such a knowledge of the conditions existing in the field that it is no longer considered necessary for them to remain away from Washington. Furthermore, the important experimental work carried on at Eustis, Fla., has been seriously interrupted by freezes. For these and other reasons plans have been made to have the two assistants in charge of the work return to Washington, where the future laboratory investigations will be carried on. For the experimental field work a small garden can be obtained, free of cost to the Department, below the frost line. Here the necessary field work can be carried on at comparatively little expense and without danger of interruption from frost and freezes. It is planned to continue the work on the various diseases of citrus and other subtropical fruits, special attention to be given to the broader questions of obtaining vigorous and disease-resisting varieties by selection, breeding, etc. It is planned that one of the assistants now engaged in this work shall devote special attention to some of the fundamental principles of plant nutrition. This matter is important, and our knowlege of the relation of nutrition to the growth, productiveness, and health of plants is yet meager.

In the work on cereals and cereal diseases it is believed that the field investigations to determine the varieties resistant to rust can be completed. Further studies of the life history of the various rust parasites will be made.

REPORT OF THE CHIEF OF THE DIVISION OF BIOLOGICAL SURVEY.

U. S. DEPARTMENT OF AGRICULTURE,
DIVISION OF BIOLOGICAL SURVEY,
Washington, D. C., June 30, 1897.

SIR: I have the honor to submit herewith a report of the doings of the Biological Survey for the fiscal year ending June 30, 1897.

Respectfully,

C. HART MERRIAM, *Chief.*

Hon. JAMES WILSON, *Secretary.*

WORK OF THE YEAR.

Two principal lines of work are carried on by the Biological Survey—a study of the geographic distribution of animals and plants, with a view to determining the boundaries of the natural life zones and their subdivisions, and a study of the food habits of birds and mammals—for the purpose of ascertaining the economic relations of our native species. Work along both of these lines has been continued.

GEOGRAPHIC DISTRIBUTION.

During the fiscal year ending June 30, 1897, field work has been done in Washington, Oregon, California, Nevada, Utah, Wyoming, Nebraska, Kansas, Indian Territory, West Virginia, Mexico, and western Canada.

A special effort has been made to ascertain the boundaries of the life zones of the various species of plants and animals in the northwestern corner of the United States, particularly in Oregon and Washington. During the summer of 1896 the Biological Survey had three field parties in Oregon, working under my personal supervision; and at the present time (June 30, 1897) we have four parties in Washington. It is hoped that by the end of the season enough material will be collected to admit of mapping the life zones of these two States with as much detail as the present base maps permit. In this connection it may be remarked that the need of better topographic maps is nowhere more keenly felt than in the work of the Biological Survey. The absence of such base maps renders it impossible, in areas aggregating many hundreds of thousands of square miles, to plat the distribution of animals and plants with any accuracy.

CEREAL INVESTIGATION.

Early in the year plans were made for undertaking a series of investigations which had long been contemplated, with a view to rendering

the results of previous studies on geographic distribution immediately available for practical agriculturists. The first investigation of the kind had for its object the determination of the varieties of corn, wheat, and oats which could be most profitably cultivated in each of the natural life zones of the United States, and was intrusted to Prof. C. S. Plumb, director of the Agricultural Experiment Station at Lafayette, Ind. Information respecting the different varieties of cereals was collected from more than 1,000 grain growers, located in all of the States of the Union and in several of the Canadian provinces. The tabulation of the data has been made by Professor Plumb, who has submitted a preliminary report, accompanied by maps, showing in detail the areas or belts in which some thirty varieties of corn, wheat, and oats are now grown with success. This report demonstrates in a most gratifying manner the fact that areas of successful cultivation of particular varieties of cereals conform in the main to the boundaries of the natural life zones and their subdivisions. Professor Plumb's report is now ready for publication and will be issued in the near future.

LABORATORY WORK.

Studies of the economic relations of various mammals and birds have been continued during the year, and special efforts have been made to obtain a sufficient number of birds' stomachs to complete the investigations already begun on the food of certain species. More than 3,000 birds' stomachs have been added to the collection, and 2,342 have been examined. The species now being studied include mainly flycatchers, sparrows, bobolinks, cowbirds, red-shouldered and yellow-headed blackbirds, shrikes, and blue jays. A report on the blue jay was completed and published in the Yearbook for 1896. The investigations on the shrikes, blackbirds, and flycatchers have been practically completed, and the results are now being put in shape for publication. An abstract of the reports on these and other species previously studied in the laboratory, about thirty in all, was published as Farmers' Bulletin No. 54, to meet an unusual demand for information concerning the food habits of native birds.

The stomachs examined in the laboratory during the twelve months ending June 30, 1897, may be grouped as follows:

Sparrows	1,440
Blackbirds	531
Flycatchers	257
Thrushes	79
Swallows	22
Miscellaneous	13
Total	2,342

[illegible] SPECIMENS

[illegible] sent to [illegible] the work has [illegible] of much edu- [illegible] ledge of our [illegible]

[illegible] prepared for [illegible] owing to lack

of funds it was found necessary to utilize mainly the material which had been exhibited the previous year at Atlanta. Groups of characteristic mammals and birds of the South, and species which are specially injurious or beneficial to agriculture, were shown, and the specimens were supplemented by maps and photographs, the whole exhibit being designed to illustrate the more important facts of geographic distribution and the food habits of certain species of economic importance. During the past few years the division has been called upon to arrange exhibits for four expositions. The preparation, installation, and repacking of material for such exhibits not only consumes a large amount of time which can ill be spared from other work, but requires the services of the most intelligent and skillful assistants, thus proving a serious loss to the division.

PUBLICATIONS.

In addition to a Farmers' Bulletin on birds and a paper on the food of the blue jay an article on "Extermination of noxious animals by bounties" was published in the Yearbook for 1896, and a circular on Bird Day in the Schools was prepared and distributed among teachers and school superintendents. A technical paper on the family of bats, to which nearly all the North American species belong, has been completed by Mr. Gerrit S. Miller, jr., a former assistant, and will appear as North American Fauna No. 13.

The main object of the work of the division being to collect and disseminate information regarding the geographic distribution and food habits of mammals and birds, particularly those of economic importance, provision should be made for the publication of larger editions of the various reports. During the past year there has been an unusual call for information on birds, and hundreds of requests have been received for publications for the use of teachers in the public schools. At present the only way to meet such demands is by circulars or by Farmers' Bulletins. As a rule, requests for other bulletins can not be granted, because the number of copies ordinarily printed is entirely too small to meet the demand. It would seem wise to provide more generously for the distribution of reports which are designed for purposes of instruction, particularly those sought by teachers in the schools and colleges.

BIRD DAY IN THE SCHOOLS.

One of the most promising methods of popularizing bird study was suggested three years ago by Prof. C. A. Babcock, of Oil City, Pa., who proposed to set apart one day in the school year for the purpose of instructing the pupils regarding birds. This suggestion, which seemed both feasible and practical, was heartily indorsed by the Department. A circular was prepared, setting forth the objects of Bird Day and the importance of birds to agriculture, and more than 15,000 copies were distributed during the year—mainly to teachers and superintendents of schools. In Wisconsin a law was enacted combining Bird Day with Arbor Day, and on April 30, 1897, in accordance with the proclamation of the governor, suitable exercises were held in the schools throughout the State. In Arkansas, Illinois, Nebraska, and Iowa efforts to secure a general recognition of the day met with much encouragement, and all the reports thus far received indicate that Bird Day was a success wherever observed. Enough has already been accomplished to dem-

onstrate the possibility of making the public schools a potent factor in the dissemination of information regarding birds and bird protection.

ROUTINE WORK.

Routine work continues to consume a large part of the time of the office force. The number of letters received during the year was about 4,400, and many of them were accompanied by schedules, reports, and notes, which were examined and filed for future reference. Much of this correspondence consists of inquiries concerning reports of the division, or publications on mammals and birds in general, which can be answered in part by circulars, but the majority of the letters require special replies, often necessitating the expenditure of considerable time in looking up data. About 2,700 letters were written and several hundred schedules distributed to correspondents; about 300 packages were received and 900 sent out. Other regular work consists in the tabulation and arrangement of reports and information received from field naturalists and others, the identification of specimens, the care of collections, attention to the needs of field naturalists, the preparation of reports and bulletins for publication, and of reference lists useful in the work of the division.

OUTLINE OF FUTURE WORK.

PLANS FOR THE FISCAL YEAR ENDING JUNE 30, 1898.

The plans for the fiscal year 1897–98 contemplate the continuance of work along lines already begun. A revised edition of the Biogeographic map of North America, showing the boundaries of the life zones as corrected to the end of 1897, will be issued. The preliminary biological survey of Oregon and Washington, now well under way, will be completed and the report prepared for publication, and it is expected that additional work will be undertaken in Nevada and California. A report on the distribution of cereals, by Prof. C. S. Plumb, will be published at an early date, and, if possible, similar investigations on other crops will be undertaken. It is planned to continue in the field and laboratory the study of the distribution and food habits of the various kinds of mammals and birds, and if the fund admits, cooperative work may be begun in one or more States in connection with the State experiment stations or other agencies.

Extended investigations have been made on several groups of mammals and birds of economic importance, such as the ground squirrels, kangaroo rats, flycatchers, blackbirds, sparrows, and others, and it is expected that most of these studies will be completed during the next year and the results arranged for publication.

PLANS FOR THE FISCAL YEAR ENDING JUNE 30, 1899.

The preliminary study of the principal features of the geographic distribution of animals and plants in the United States has been nearly completed, and a revised edition of the map showing the natural life zones or agricultural belts of North America will be ready for publication in a few months. Future editions should be issued as revisions in details accumulate. In addition to this map, there is an urgent demand for a large scale faunal map of the United States. Numerous requests for such a map have already been received, not

only from practical agriculturists, but also from teachers who need it for purposes of instruction. Maps showing the distribution of particular animals, birds, trees, and crops are also in demand, but can not be supplied until the collection of the necessary data has been completed, tabulated, and platted. These requests all point to the urgent need for increased funds which can be devoted to this work. During the eight years since the study of geographic distribution was begun by the division, the principles governing the distribution of life in America have been discovered, the laws of temperature control have been formulated, and the boundaries of the various zones have been run with approximate accuracy. The work remaining to be done relates mainly to the more exact location of the boundary lines of the zones and their subdivisions and the actual coordination of the crop belts with the life zones. Under the latter head an exceedingly important piece of work has just been completed by Prof. C. S. Plumb, relating to the distribution of cereals in the United States. (See p. 16.)

The Biological Survey aims to define and map the life zones of North America and their subdivisions, to publish lists of the native or indigenous species characteristic of each, and lists of the agricultural products to which each is fitted. This involves a comprehensive study of the distribution of life with reference to the adaptability of the various parts of our domain to different agricultural and horticultural products—not only those now cultivated in this country, but also those which from their importance in other lands are likely to prove of value if introduced on fit soils and under proper climatic conditions.

In studying the geographic distribution of animals and plants, the first step is the accurate determination of the species whose distribution is to be mapped. In many groups this has been already done, so that the work of mapping is comparatively easy; but in other groups the species have not yet been defined and revisionary studies must precede the mapping. Such studies of mammals have been carried on in the division for nearly ten years and the results published in North American Fauna. It is gratifying to be able to state that the number of groups still unworked is small. When these have been "revised," it will be possible to continue the series of faunal papers begun in Nos. 3, 5, and 7 of North American Fauna. Such papers, treating of the natural history of particular States and Territories, have a high educational value. A considerable amount of work of this character is already far advanced, and its publication may be begun in the near future.

During the year just passed, propositions to cooperate with State agencies (usually experiment stations or colleges) in making State biological surveys have been received from no less than five States in the West and South. Important and desirable as such cooperation would be, the appropriation for the coming year is too small to permit it. It is hoped, however, that the appropriation for the year ending June 30, 1899, will provide for work of this kind.

It is planned to continue the economic studies of the food habits of birds and mammals as heretofore.

The appropriation now available for biological investigations is barely sufficient to carry on work already begun, and will not admit of taking up new lines of study, however important. The present lump fund of $17,500 was fixed several years ago when the Biological Survey was but an incidental feature of the investigations intrusted

of the United States must include an investigation of the fauna and flora of certain parts of Mexico and tropical America. As is well known, this region is unusually rich and varied in indigenous animal and plant life, and also in certain agricultural products which might be introduced with profit into the United States. I am therefore led to renew the recommendation made in my last annual report, that an addition of $5,000 be made to the lump fund for biological investigations. This small addition would enable the division (1) to increase the work on geographic distribution; (2) to undertake cooperative State biological surveys; and (3) to continue investigations on the fauna and flora of tropical America.

REPORT OF THE SPECIAL AGENT OF THE OFFICE OF FIBER INVESTIGATIONS.

U. S. DEPARTMENT OF AGRICULTURE,
OFFICE OF FIBER INVESTIGATIONS,
Washington, D. C., August 28, 1897.

SIR: I have the honor to report on the operations for the past year and upon the proposed future work of the Office of Fiber Investigations.

Respectfully,

CHAS. RICHARDS DODGE,
Special Agent.

Hon. JAMES WILSON, *Secretary.*

WORK OF THE YEAR.

EXHIBIT AT NASHVILLE EXPOSITION.

The greater part of the time of the special agent during the first six months of the past fiscal year was taken up with the completion of the Descriptive Catalogue of Useful Fiber Plants of the World, upon which he has been at work actively since the fall of 1893. For several months in the latter half of the past fiscal year he was occupied with the preliminary work in the preparation of the exhibit of the Department of Agriculture, to form a part of the Government display at the Tennessee Centennial Exposition. During about two months he was under detail to the city of Nashville, where he was engaged in superintending the installation of the Department's exhibit and with other matters relating to same.

In addition to this work a very nearly complete collection of the commercial fibers of the United States, in series, was gotten together and arranged in panels under plate glass, which will be returned to the museum at the close of the Nashville Exposition. While this work was being prosecuted a large number of duplicates of our commercial fibers were secured. These will be prepared and arranged this winter to form twelve or fifteen industrial museum collections, to be deposited with leading American colleges, several of the collections having already been promised in response to urgent applications for such educational material. The donation of these commercial series by the Department will assist materially in enlarging the present meager collection of this Department, through the possibility of exchanges, and will thus further the establishment of a national economic collection of fibers, to be preserved in Washington. The importance of building up such a collection will be manifest when it is called to mind that much of the valuable fiber material collected in past years and exhibited in the old museum (the present library hall) is not now in existence, while the extensive industrial collection of

fibers of the world prepared for the Chicago Exposition was at its close turned over to the Field Columbian Museum. The publication of the Descriptive Catalogue of Fibers at this time will facilitate the work of collecting valuable foreign material, as it can be used as a check list by foreign recipients of the volume.

The Department has recently received from India 400 pounds of jute seed, which it is expected to distribute in peck lots this winter to a carefully selected list of experimenters. The main object of the importation was to produce a large crop of jute at some point where machinery can be set up and run, in order to ascertain precisely the cost of producing and cleaning jute in this country. American-grown jute is better than India fiber, because more carefully cultivated, and therefore would bring a higher price for employment in the higher uses of this textile. This argues a possible field for a new, though in a measure restricted, industry. This means that we could not compete with the rough product employed in paper manufacture and in the manufacture of cotton bagging, but we can produce jute for fine spinning.

PLANS AND RECOMMENDATIONS.

COTTON AND RAMIE MACHINE TRIALS.

In October the Office of Fiber Investigations will conduct a roller-gin trial in Texas, to demonstrate the commercial value of Egyptian cotton, the culture of which has been the subject of most careful experiment by Mr. W. H. Wentworth for several years.

The interest in new ramie decorticating machinery continues, and several new machines are ready for test. A trial of these machines was to have been held this fall, but a proper growth of ramie could not be assured, owing to the replanting this season of the ramie tract at the point where the Government trials are held. A new French machine now turns out raw fiber approaching in quality the China grass of commerce, though the capacity of the machine has yet to be tested before the Department can make any authoritative statements regarding its ability to turn out fiber in paying quantity. The inventor of this machine will send two machines to the United States in 1898 for extended trial, if desired. As there are several untried American machines, it is my desire to hold a trial of new ramie decorticating devices in the fall of 1898 at the Audubon Park Experiment Station, New Orleans.

Following these trials it is desired to undertake an investigation which will show the relative yield of ramie fiber per acre from American-grown stalks. All our figures of yield are based on foreign tests, or on mere estimates put forth by those interested in machines. It is the purpose to secure, if possible, a ton or more of Southern-grown ramie ribbons, which will be stripped and dried under the direction of the Department, and afterwards treated for the spinning fiber by Department chemists, and, at the same time, by spinners in the United States who are contemplating manufacture, and who control commercial decorticating processes. That the bark of an American-grown ramie [illegible] is "thinner" in the fiber layer than the Chinese has been [illegible] possibility, and it is important to settle the question of [illegible], which can be done at a small expenditure of money out of the [illegible] appropriation [illegible] Office of Fiber Investigations. Before [illegible] ascertaining the

American yield of the fiber per acre, both of which relate to the agricultural problem, no further experimental work by the Government is necessary or advisable, for the manufacturers are already working out the commercial problems with private capital. As for the necessity for large special appropriations for extensive general experiments to aid in floating private fiber companies, in my estimation, such appropriation would be disastrous to the healthy growth of the ramie industry, and would work great injury to the intelligent private experimenters who are quietly producing results with their own means and who do not desire Government aid further than that now afforded them through cooperation with the Office of Fiber Investigations.

FLAX ON PUGET SOUND.

The Department has just received from William Barbour & Sons, Limited, Lisburn, Ireland, the results of the retting and scutching experiments conducted by this firm in Ireland with a ton of flax straw grown in the Puget Sound region of Washington under the direction of the Office of Fiber Investigations in its experiments of 1895. These cultural experiments developed the fact that for flax culture the Puget Sound region is the equal in climate of some of the best flax-producing regions of Europe. The superior quality of straw produced, which resembled the straw of the famous Courtrai region of Belgium, attracted the attention of the Barbours, resulting in this firm undertaking the retting experiment in Ireland at their own expense.

With the Barbour report was received a large assortment of flax, the best scutched fiber of which is valued by them at $350 per ton. Out of this lot, however, flax was hackled that is worth 12 pence per pound, or about $500 a ton. There is no doubt that a better quality of straw can be grown in this region, with experience, than that produced in the Department's experiment. Only 1½ to 2 bushels of seed were used per acre, while in Belgium 3 bushels are oftener seeded per acre. In this experiment over 7 tons of straw were produced upon 5 acres, and also about 70 bushels of salable seed. This experiment has demonstrated conclusively that it is possible to produce good fiber and good seed *in the same plant* in the face of the cry of importers and some of the Eastern mill men that the practice is impossible.

The success of the Puget Sound experiment has stimulated experiment in other parts of the Pacific Coast, and in Oregon, particularly, considerable fiber flax is being grown as an experiment this season. As there is difficulty in securing proper seed, and the Department can aid in these experiments by supplying foreign seed in limited quantities, I suggest the purchase of 100 bushels of Riga seed this winter to be distributed by the Office of Fiber Investigations to those who wish to experiment with this culture. In this connection a flax cultural experiment by irrigation is earnestly recommended.

MACHINE FOR CLEANING HEMP.

There is need also of an improved machine for cleaning hemp, to supersede the clumsy hemp brake now employed. There are several new hemp machines and their inventors would be glad to enter a public trial under official auspices, in order to compare principles of construction and give a starting point for improvement.

As hemp is largely grown in Nebraska, the special agent desires to hold an authorized official trial of hemp machines next season in connection with the forthcoming Omaha exposition. By taking the matter in time there is no doubt a number of hemp machines would be entered for exhibition, and subsequent official trial by this Department. Through cooperation with the Omaha exposition officials, both the flax and hemp industries may thus be exploited, and as a full collection of American and foreign hemp and flax samples will be on exhibition in the Government building the rare opportunity for object teaching should not be lost.

In the past year a new brush fiber plant has been brought to public notice, which has been tested by the Department, and which may be considered a promising commercial species.

Since the last report but two publications have been issued by this office: Report No. 8, on Hemp and Jute Culture, and Report No. 9, A Descriptive Catalogue of Useful Fiber Plants of the World. A fifth edition of Farmers' Bulletin No. 27, Flax for Seed and Fiber, has, however, been printed.

REPORT OF THE CHIEF OF THE DIVISION OF PUBLICATIONS.

U. S. DEPARTMENT OF AGRICULTURE,
DIVISION OF PUBLICATIONS,
Washington, D. C., August 20, 1897.

SIR: I have the honor to submit herewith, in compliance with your order of June 21, 1897, a report on the work of this division for the year ending June 30, 1897, together with recommendations and estimates for the fiscal year ending June 30, 1899.

Respectfully,

GEO. WM. HILL, *Chief.*

Hon. JAMES WILSON, *Secretary.*

WORK OF THE YEAR.

PUBLICATIONS SUPERVISED.

During the fiscal year ending June 30, 1897, this division edited and supervised 424 publications, as follows:

Chargeable to regular fund	233
Chargeable to divisional funds	23
Chargeable to Farmers' Bulletin fund	58
Printed at Weather Bureau	98
Printed as executive documents	12
Total	424

Of the above number 86 were reprints, and the aggregate number of copies printed of all publications was 6,541,210, being slightly less than during 1896, the figures for the last-mentioned year being 6,561,700. In 1896, however, two editions of the Yearbook (for 1894 and 1895), aggregating 1,000,000 copies, were received, while during the year 1897 no edition of that publication was delivered. Leaving the Yearbook out of consideration in the comparison of the work of the years 1896 and 1897, it will be seen that during the latter year there was an increase of nearly 1,000,000 copies of the publications proper issued by the Department.

Exclusive of reprints, the number of printed pages of original matter edited and prepared for the Public Printer was 11,715. The number of pages represented by the 86 reprints was 4,434.

The following statement shows the number of publications and the total number of copies of all publications of the Agricultural Department issued during the fiscal years ending June 30, 1893–1897:

Publications issued by the United States Department of Agriculture during the years 1893–1897.

Years.	Publications.	Total number copies.
1893	210	2,739,084
1894	205	3,169,310
1895	254	4,100,660
1896	376	6,561,700
1897	424	6,541,210
Total	1,469	23,061,964

The above figures supply striking evidence of the good results of the policy which has of late years prevailed in the publication work of the Department, namely, the presentation of subjects in concise and inexpensive form, permitting of a vast increase in the number of publications and of the copies printed with comparatively slight increase in the sums expended for printing.

The total number of requisitions drawn upon the Public Printer was as follows:

Main office	570
Branch office	1,355
Total	1,925

In addition, there were issued during the year 233 requisitions for illustrations, making a total of 2,158 requisitions for work which passed through the office of the Division of Publications in the period of twelve months, being slightly under 180 a month, or about 7 for every working day in the year.

Every one of these requisitions had to be made in duplicate, entered in the necessary books, and a ledger account of the same kept with every bureau, division, and office in the Department.

The mere recital of these facts is sufficient to show how inadequate are the present accommodations of the division, when it is remembered that all the business represented by the above figures is conducted in two rooms, one of them a small private office, editorial work and proof reading being done in the same room as the miscellaneous business, typewriting, etc.

THE YEARBOOK.

In the Yearbook for 1896 the same general plan and style were followed as in that for 1895. The number printed was the same, namely 500,000, of which, as usual, 30,000 were placed at the disposal of this Department. This is but 5,000 more than was allotted to it [illegible] ago, and is quite inadequate to supply the needs of the [illegible]ment, even though its distribution be confined to correspond[illegible] and others who have actually earned the right to such recogni[illegible]y services rendered. This was strikingly exemplified in the [illegible]book for 1895, the first delivery of which was received from the [illegible]lic Printer in [illegible], 1896, and the [illegible]re supply of which was [illegible]hausted befo[illegible] [illegible]t of the [illegible] [illegible]ing. This being made

known by circular to Senators and Representatives, many of these gentlemen who still retained a portion of their quota undistributed, kindly placed several copies at the disposal of the Secretary of Agriculture, the aggregate number so received being between 7,000 and 8,000 copies. By this means we were enabled to satisfy the most urgent of the demands for this work addressed to the Department. It is earnestly recommended that the Department's quota of the Yearbook be increased to 50,000 copies.

Owing to seemingly unavoidable delays the Yearbook for 1896 has not appeared as promptly as that of 1895. The former was delivered in the month of June, 1896, while at the close of the fiscal year 1897 the Yearbook for 1896 was still in the hands of the Printer. It is due to that officer to state that the delays referred to are not chargeable to his office.

INDEX TO THE REPORTS OF THE STATISTICIAN.

During the year there has been prepared in this division a synoptical index to reports of the Statistician of this Department, covering the years 1863 to 1894, inclusive. This work has been completed, and is now in the hands of the Public Printer. It will make a book of probably some 300 pages, containing approximately 5,000 entries. As in the case of the index to the annual reports, issued last year, the work was confided to Mr. George F. Thompson. Soon after it was undertaken this gentleman was assigned to the charge of the Document and Folding Room, which had been transferred to this division at the close of last year. Notwithstanding the engrossing nature of the duties since imposed upon him, Mr. Thompson, of his own motion, continued to devote considerable time outside of office hours to the preparation of this index. During the past six months other members of the force have been able to cooperate with him in the work, but it is due to Mr. Thompson to remark, that without the large amount of his own time devoted to the work its accomplishment would have been impracticable.

The publication of this index will mark an important additional step in the work of indexing the publications of the Department—an undertaking which I have had the honor to recommend earnestly in previous reports and the necessity for which is daily growing more urgent.

BRANCH PRINTING OFFICE.

The transfer of the printing office of the Department to the control of the Public Printer, under section 21, act of January 12, 1895, was followed February 14 of the same year by an order of the Secretary of Agriculture, in accordance with that law, placing this part of the work under the supervision of the chief of this division. As already stated in the beginning of this report, the total number of requisitions drawn upon the branch printing office during the past year aggregates 1,355, as compared with 1,237 the year previous, while the cost of the work done has aggregated $17,075.18, by comparison with $16,049.34 for the previous fiscal year.

In estimating the relative cost of the Government printing between the year under consideration and the fiscal year 1894, the first year when the regular printing fund amounted to $85,000, at which figure it has since stood, it should be remembered that in 1894 and up to June 30, 1895, the Department had a special printing appropriation

and the privilege of assisting the work in the branch printing office by the occasional assignment of laborers from other divisions, consequently no part of the cost of the work done in the branch office was charged to the regular printing fund. With the transfer of the branch office to the control of the Public Printer all appropriations for the Department printing outside of the regular fund and the Farmers' Bulletin and some of the divisional funds ceased. The entire cost of the branch office being therefore chargeable to the regular printing fund, it follows that during the past two years the sums above named as the cost of maintaining the branch office (aggregating over $33,000) should be deducted, respectively, from the annual appropriations of $85,000 for each of the two years in question. Consequently, apart from the Farmers' Bulletins and printing done from the divisional funds, there was left of the regular fund to defray the expense of the 800 publications chargeable thereto in the two years ending June 30, 1897, $137,000, or a little over $63,000 for each year, by comparison with $170,000 available to cover the expense of the 445 publications issued in the two years ending June 30, 1895. As a result of this state of things and of the great increase in the call for Farmers' Bulletins for the use of Members of Congress, which necessitated the printing of a considerable number of these out of the regular printing fund, publications ready for the printer early in May had to be held back, thus entailing delay and accumulating charges against the present fiscal year. Under these circumstances, it seems as if no more need be said to justify the recommendation which I now have the honor to make, that the sum appropriated for the use of this Department in the hands of the Public Printer should be increased for the next fiscal year from $85,000 to $100,000.

COST OF PRINTING AND BINDING.

The following statement shows the apportionment of the printing fund among the several bureaus and divisions of the Department, and also the amount of the special funds drawn upon for publications:

Accounts		$396.57
Animal Industry	$3,717.59	
Animal Industry (special)	1,503.68	
		5,221.27
Agrostology		3,049.51
Botany	475.30	
Botany (special)	1,119.47	
		1,594.77
Chemistry		1,777.09
Entomology	2,973.06	
Entomology (special)	1,272.82	
		4,245.88
Experiment Stations	18,700.33	
Experiment Stations (special)	19.60	
		18,719.93
Fiber Investigations		1,055.28
Foreign Markets		2,830.71
Forestry		3,254.16
Library		1,961.91
Biological Survey		633.88
Pomology		1,839.75
Publications		494.12
Road Inquiry		1,482.39
ils		513.30
[illegible]s		11,422.74
[illegible]ole Physiology and Pathology		590.27
[illegible]r Bureau		5,403.15
[illegible]'s Office		4,545.40

Farmers' Bulletins		$28,565.07
Branch printing office		17,075.18
Total		116,672.33
Charged to regular printing fund	$84,191.69	
Charged to Farmers' Bulletin fund	28,565.07	
Charged to division funds	3,915.57	
Total		116,672.33

It is of course impossible to give the precise cost of printing and binding for the Department. The cost of the publications issued as executive documents, and which during the past year numbered 12 and which generally exceeds that of all the other publications, amounting to 412, is not known to us, the appropriations therefor being made directly to the Public Printer and based not on our estimates, but on his. Before the passage of the act of January 12, 1895, however, when the annual report of the Department, now represented by the Yearbook, was provided for by a special appropriation, the sum set aside to defray the cost of the half million copies of that publication amounted to $300,000. The executive documents include, moreover, 30,000 copies of the Report of the Chief of the Bureau of Animal Industry and 4,000 of the Report of the Chief of the Weather Bureau. It is, therefore, to be presumed that, apart from the regular printing fund of the Department in the hands of the Public Printer and the amount appropriated for the Farmers' Bulletins and allowed for printing in certain of the divisional appropriations, the Congressional appropriations for the publications of this Department, mainly for distribution by Congressmen, will aggregate over $400,000. On this basis, then, the total cost of printing for the past year would exceed $516,000, not to speak of the cost of distributing 6,000,000 publications.

NUMBER OF PUBLICATIONS ISSUED BY DIFFERENT DIVISIONS.

The following statement shows the number of publications, original and reprints and the total number of copies, issued by each bureau, office, and division:

Original publications and reprints, and number of copies of same, by divisions.

Division.	Publications.		Total number publications.	Total number copies.
	Original.	Reprint.		
Secretary's Office	21	8	29	466,000
Executive Documents	9	3	12	199,610
Accounts	1		1	250
Agrostology	14	1	15	88,650
Biological Survey	4	3	7	58,750
Botany	20	2	22	108,500
Animal Industry	18	8	26	637,500
Chemistry	4	2	6	104,750
Entomology	27	6	33	259,350
Experiment Stations	37	35	72	1,170,400
Fiber Investigations	2	1	3	5,750
Forestry	6		6	8,150
Library	5		5	3,750
Pomology	6	2	8	29,500
Publications	14		14	206,000
Road Inquiry	12	3	15	86,250
Soils	5		5	7,000
Statistics	22	3	25	2,322,000
Vegetable Physiology and Pathology	12	8	20	231,250
Weather Bureau	97	1	98	547,450
Special Agent for the Purchase of Seeds	1		1	250
Seeds	1		1	100
Total	338	86	424	6,541,210

Of the 98 publications of the Weather Bureau, 32 were issues of the Climate and Crop Bulletin, 16 issues of Monthly Weather Review, 20 snow charts, and 12 Daily Weather Maps.

FARMERS' BULLETINS.

For printing Farmers' Bulletins during the year there was expended $34,521.03, of which sum $5,955.96 was paid from the general printing fund and $28,565.07 from the Farmers' Bulletin fund. The total number of copies printed was, on account of Farmers' Bulletin fund, 1,997,000; on account general printing fund, 390,000. The average cost per copy of the bulletins printed was a little higher than last year owing to the proportionately large demand for the larger and more expensive bulletins, but still amounted to less than 1½ cents apiece. The total number of Farmers' Bulletins printed was 58, including reprints. Of the total number of copies of Farmers' Bulletins printed 1,967,237 were distributed to Senators, Representatives, and Delegates in Congress.

Farmers' Bulletins printed and distributed to Congressmen during the fiscal year.

Name of bulletin.	Total number printed.	Number distributed to Congressmen.
Published in 1896-97.		
No. 42.—Facts About Milk	130,000	63,297
No. 43.—Sewage Disposal on the Farm and the Protection of Drinking Water	50,000	22,982
No. 44.—Commercial Fertilizers: Composition and Use	70,000	44,562
No. 45.—Some Insects Injurious to Stored Grains	100,000	46,654
No. 46.—Irrigation in Humid Climates	45,000	19,826
No. 47.—Insects Affecting the Cotton Plant	50,000	18,480
No. 48.—The Manuring of Cotton	50,000	18,796
No. 49.—Sheep Feeding	50,000	24,328
No. 50.—Sorghum as a Forage Crop	30,000	14,902
No. 51.—Standard Varieties of Chickens	200,000	139,172
No. 52.—The Sugar Beet	150,000	113,978
No. 53.—How to Grow Mushrooms	100,000	7,186
No. 54.—Some Common Birds in Their Relation to Agriculture	50,000	34,695
No. 55.—The Dairy Herd: Its Formation and Management	20,000	13,902
No. 56.—Experiment Station Work	30,000	9,550
No. 57.—Butter Making on the Farm	100,000	16,935
Reprints.		
No. 3.—The Culture of the Sugar Beet	.....	4,764
No. 6.—Tobacco: Instructions for Its Cultivation and Curing	20,000	5,565
No. 11.—The Rape Plant: Its History, Culture, and Uses	.....	1,092
No. 14.—Fertilizers for Cotton	.....	9,301
No. 15.—Some Destructive Potato Diseases: What They are and How to Prevent Them	40,000	57,586
No. 16.—Leguminous Plants for Green Manuring and for Feeding	50,000	38,590
No. 17.—Peach Yellows and Peach Rosette	.....	1,329
No. 18.—Forage Plants for the South	50,000	39,759
No. 19.—Important Insecticides: Directions for Their Preparation and Use	30,000	37,697
No. 20.—Washed Soils: How to Prevent and Reclaim Them	50,000	40,474
No. 21.—Barnyard Manure	80,000	76,075
No. 22.—The Feeding of Farm Animals	110,000	108,104
No. 23.—Foods: Nutritive Value and Cost	50,000	37,155
No. 24.—Hog Cholera and Swine Plague	115,000	134,875
No. 25.—Peanuts: Culture and Uses	2,000	3,955
No. 26.—Sweet Potatoes: Culture and Use	40,000	35,381
No. 27.—Flax for Seed and Fiber	.....	9,912
No. 28.—Weeds, and How to Kill Them	50,000	54,692
No. 29.—Souring of Milk and Other Changes in Milk	45,000	47,893
No. 30.—Grape Diseases on the Pacific Coast	.....	7,656
No. 31.—Alfalfa, or Lucern	30,000	39,581
No. 32.—Silos and Silage	.....	23,789
No. 33.—Peach Growing	40,000	38,782
No. 34.—Meats, Composition and Dietetic Value	50,000	41,230
No. 35.—Potato Culture	60,000	87,553
No. 36.—Cotton Seed [illegible]	.....	24,539

Farmers' Bulletins printed and distributed to Congressmen, etc.—Continued.

Name of bulletin.	Total number printed.	Number distributed to Congressmen.
Reprints—Continued.		
No. 37.—Kafir Corn: Characteristics, Culture, and Uses	30,000	28,515
No. 38.—Spraying for Fruit Diseases	40,000	51,795
No. 39.—Onion Culture	70,000	56,801
No. 40.—Farm Drainage	30,000	57,125
No. 41.—Fowls: Care and Feeding	80,000	156,426
Total	2,387,000	1,967,237

	Copies.	Cost.
Printed and paid from Farmers' Bulletin fund	1,997,000	$28,565.07
Printed and paid from general printing fund	390,000	5,955.96
Total	2,387,000	34,521.03

The appropriation for the current fiscal year for the preparation and printing of Farmers' Bulletins amounts to $35,000, a sum but very little in excess of the amount actually paid during the past year for printing only. The extent to which Congressmen have availed themselves more and more every year of these bulletins is shown by the figures in the following table:

Farmers' Bulletins printed, Nos. 1 to 57.

Date.	Total number issued.	Distributed to Congressmen.
Prior to 1894	540,000	.....
In 1894	278,500	.....
In 1895	1,567,000	885,770
In 1896	1,891,000	1,316,695
In 1897	2,387,000	1,967,237
Total	6,663,500	4,169,702

Under the circumstances it seems likely that every Congressional quota will be utilized next year, and, as it is extremely improbable that any part of the regular printing fund will be available for printing Farmers' Bulletins, it is impossible for the Department to be as liberal in its distribution to Congressmen as in former years. Hence it has been found necessary to reduce the quota to Congressmen for the current year from 5,000 to 4,000 copies, aggregating even then for Members of Congress a considerable excess over the two-thirds required for their use by the appropriation bill. Allowance under the present state of appropriations can only be made for printing 2,000,000 copies.

Moreover, owing to the very great and continued increase in the number of publications and other documents handled in the Document Room, to print more would be simply to accumulate publications in our already overcrowded storerooms, as it will be evidently impossible to maintain under the appropriations at our disposal a force adequate to handling a larger number.

It is safe to say that no part of the work of the Department for many years past has achieved more useful results or commanded the popularity to be credited to the Farmers' Bulletins. It is the cheapest, most practical, and most expeditious manner yet devised for carrying out one of the main purposes of the Department's existence, namely, the diffusion of information relating to agriculture in the most comprehensive sense of that term. For these reasons a considerable increase in the appropriations, both for printing, preparation, and distribution of Farmers' Bulletins, is most desirable.

Following the law regulating the distribution of seeds, under the appropriation in which the first special appropriation for Farmers' Bulletins was included, the quota assigned to each Member of Congress has been treated as reverting to the Department if not called for before the expiration of the fiscal year. Last year no exception was taken by Members to this action. This year, however, demands have been made by several Members for their full quota, and, in addition, for the quota of last year which they had not drawn, and in some cases for the last year's quotas of other Members, from whom they obtained orders transferring their quotas. The difficulties of distribution and the embarrassment already occasioned by our inadequate storage facilities will be greatly increased unless the Department is enabled to close out each year's distribution at the close of the year and is relieved from carrying over a large supply of these bulletins from year to year. To do this would require not only a very large increase of storage room, but would necessarily compel the Secretary of Agriculture to greatly limit the freedom of choice of Members in the selection of particular bulletins. It would manifestly be impossible to reserve from year to year, and in some cases, no doubt, for several years, a sufficient number of every bulletin to supply all demands which might be made upon us for any particular one. The claims of some members that their last year's quotas should be carried forward to their credit for the current year would be manifestly impossible for us to comply with should they increase to any considerable extent, as this would seriously infringe on our exceedingly limited appropriation for the current year. Fortunately, so far these claims have not been numerous, but in order to relieve the Secretary of Agriculture from embarrassment and to put all Members of Congress on the same footing, I respectfully recommend a change in the next appropriation bill, providing that the quotas of Members should revert to the Department when not taken away on or before the 30th day of May in each fiscal year.

[illegible]OCUMENT AND FOLDING ROOM.

[illegible] the Secretary of Agriculture [illegible] his division should be charged with [illegible] the act of January 12, 1895 (section [illegible] ontrol of the Department p[illegible]lications, "whether [illegible] distribution." B[illegible] his [illegible] came his duty to [illegible] etail of all publi[illegible] distributed [illegible] ication, an[illegible] iled report to the [illegible] annually to [illegible]

[illegible] ollowing order was [illegible] ment transferring

the control of the Document and Folding Room to the chief of this division:

U. S. DEPARTMENT OF AGRICULTURE,
OFFICE OF THE CHIEF CLERK,
Washington, D. C., July 1, 1896.

To whom it may concern:

The Document and Folding Room of the Department of Agriculture is hereby placed in charge of the Chief of the Division of Publications of the said Department, to whom the Superintendent, clerk, and all folders of that room will report for duty.

D. MACCUAIG,
Chief Clerk.

Attest:
J. B. BENNETT,
Appointment Clerk.

Under this order Mr. George F. Thompson, of the Division of Publications, was, upon the recommendation of the writer, appointed Superintendent of the Document and Folding Room. In that capacity he has submitted a report of the work of that room, which is here presented as a part of the present report:

U. S. DEPARTMENT OF AGRICULTURE,
DIVISION OF PUBLICATIONS,
Washington, D. C., July 1, 1897.

SIR: On taking charge of the document and folding room I found that nothing had been done toward carrying out the provision of the law of January 12, 1895, in regard to the distribution of public documents.[1] An inventory was therefore at once instituted, which was completed on October 16, and arrangements were made to carry into effect the section of law above referred to. The report now presented covers the operations of this office since September 22, 1896, the date of my appointment.

BOOKKEEPING.

A system of bookkeeping was adopted which provides a page for each publication. At the head of the page is given the title and number of the publication and the name of the division of the Department from which it emanates. The Public Printer is charged with the number ordered and credited as deliveries are made. Then follow the entries of distribution in the form shown in the appendix (p. 45), giving a list of publications received and their distribution in detail. In the appendix the item "miscellaneous" includes the greater part of the work in keeping the record, for it is composed principally of single orders.

The foreman of the mailing room is instructed to mail nothing except upon orders signed by the Chief of the Division of Publications. These orders are made by the clerical force in my charge from the mass of requests for documents that come in the daily mail; they are numbered serially by quarter years, and the record is kept by entering the date and number of order. The record is not made until the orders bear the stamp of the mailing room, showing that they have been filled. As these orders are preserved, the date and number in the book show at once where the order may be found, if wanted.

A separate set of books is kept for the series of Farmers' Bulletins—one showing the distribution in detail, and the other showing the account of distribution to Senators and Representatives.[2]

CORRESPONDENCE.

One of the first directions given by the Chief of the Division of Publications was that every communication sent to the document room should have a reply.

[1] Section 92 reads as follows: "Government publications printed for or received by the Executive Departments, whether for official use or for distribution, shall be distributed by a competent person detailed to such duty in each Department by the head thereof. He shall keep an account in detail of all publications received and distributed by him. He shall prevent duplication, and make detailed report to the head of the Department, who shall transmit the same annually to Congress."

[2] A table showing this distribution appears on pages 30, 31.

This has been rigidly adhered to, although it has necessitated an increase of the clerical force. Evidence is received every day that this consideration of the rights of the public is appreciated. Publications issued by the Department since its organization number into the thousands, and the subjects treated number many thousands; and as no index of all this information has ever been made, it becomes necessary for the clerical force to familiarize itself with these documents.

So far as possible printed postal cards and letters are provided for this correspondence, but a large number of inquiries require special letters, which must be dictated. Many applications reach this Department for publications issued by some other Department; I have felt it to be my duty as a Government officer either to refer these letters to the proper Department or inform the applicants where the information or document requested may be had. This work involves some familiarity with all the Government publications, but this is made easily accessible by the indexes and monthly catalogue issued by the Superintendent of Documents.

CONSOLIDATION OF FORCES.

On taking charge of this work I found the force operating in two sections—one known as the Farmers' Bulletin section and the other the document section, being separated by the Museum. While these sections had been nominally under one management, they did not operate reciprocally. It often occurred that one section would be crowded with important work while the other would be practically idle, and vice versa. A rearrangement of rooms was at once made which brought the mailing force together in adjoining rooms at the mailing door, where the entire force would be under the constant direction of the foreman.

INCREASE OF FORCE.

At that time the force numbered about 30 persons, but the extra work incident to the Congressional distribution of seeds increased it temporarily to about 45, and since the document room undertook the additional work given it by order of the Secretary, the force has increased till it now numbers 78 persons.

PROMPTNESS IN MAILING.

Directions given me to mail all publications promptly have been carried out so far as has been possible. Delays have sometimes occurred, but they were due to the failure to receive the mailing lists from the divisions interested. Inasmuch as a scheme of distribution is furnished with the manuscript for every publication, much time and storage room (the latter a very important matter) would be saved if the division issuing the publication would prepare its lists for distribution so that you could place them in my hands while the document is going through the hands of the printer. This has been done several times by your suggestion and its success leads me to hope that an order may be made to adopt the method for all documents delivered to the document room.

FARMERS' BULLETINS FOR CONGRESSMEN.

The law providing for the printing and distribution of Farmers' Bulletins directs that they be put up ready for addressing, and to place upon the envelope the number and title of its contents. This involved a great deal of extra work, but it seemed so desirable that the method was adopted several months before the law quoted became effective. This work is done by means of a rubber stamp. The magnitude of this work may be appreciated by reference to the Congressional distribution for the fiscal year ended June 30, 1897, which was 1,967,237, and then [illegible] now that indications are that the distribution will be greater for the fiscal year [illegible] 1898.

About a million Farmers' Bulletins will be printed during the summer months; these will be put in envelopes, sealed, franked, and stamped, and thus be ready at a moment's notice when called for.

[illegible]

[illegible] above an additional work given [illegible] office by order of the Secretary. This work is the writing once each month of the envelopes for the Monthly Crop Report, and the number thus regularly addressed is about 225,000. Forty-five thousand names in the above calculation are written in duplicate—once for sending out blanks for crop reporting on the 1st of the month and once for mailing the report when it is printed. Besides these duplicate lists are sometimes [illegible] Farmers' Bulletins

In addition to the above, several employees are constantly engaged in writing envelopes for mailing the Monthly List of Publications, which of recent months has numbered 28,000 copies. Miscellaneous lists for sending circulars and Farmers' Bulletins are constantly coming to us for writing. The distribution of sugar-beet literature added very largely to our work of this character.

MISCELLANEOUS WORK.

The law specifies that one of my duties is to prevent duplication in the mailing of documents. There is but one way to carry out this provision, and that is to keep a card index of each publication. While this part of the work is not in as good condition as it should be, progress is being made. It requires, first, intelligent clerks; then many cases and cards and much room. I think enough has been done of this work to show that the method would result in a great saving to the Government. It has already been decided to keep a card index of the Yearbook for 1896, and I have no doubt the duplications arrested will be in the thousands.

This office was charged with the work of counting the seed franks, which occupied a considerable force from December 22 to May 14. These were counted and recounted, and each package bore the initials of the ladies through whose hands they passed. The total number thus handled was 3,858,281, and I take pleasure in recording the fact that not a single error was charged against the ladies who handled this great number. This is remarkable when the number counted is considered, and when it is known that some of the counters were new to the work. Most of the circulars of information of the bureaus, offices, and divisions are now printed at the branch printing office located in this Department, and it has been found to be more economical to have them folded and tipped or stitched in the document room. A few of the employees are experts in this kind of work, and the amount so done has been considerable during the last six months, and the probabilities are that it will increase rapidly hereafter.

THE QUESTION OF ROOM.

The question of room is one that should have serious attention. The employees and the documents alike are so crowded as to occasion great inconvenience. The clerical force now occupies four rooms upstairs on the north side of the Museum building and two rooms upstairs on the south side. The two mailing rooms are on the first floor on the north side. The publications occupy two rooms on the south side of the building, four rooms on the west end, two rooms in what is known as the "Forestry building," and half of the garret in the building occupied by the Division of Statistics. These rooms are now too full for convenience, and there is no opportunity for expansion.

While discussing the question of rooms I deem it my duty to call attention to the inflammable character of this building and the great mass of valuable matter which is contained in it. Can the Government afford to assume such a risk of fire?

Respectfully submitted.

GEO. F. THOMPSON,
Superintendent of Document and Folding Room.

Mr. GEO. WM. HILL,
Chief of Division of Publications.

ILLUSTRATIONS.

During the past fiscal year the total number of drawings made under the immediate supervision of the chief of this division amounted to 3,399, of which 1,687 have been reproduced for illustrations, and of these all but 30 have actually appeared in the publications of the Department during the year. In addition to the total number of drawings given above, a large number have been prepared for the Bureau of Animal Industry, the divisions of Entomology, Botany, Pomology, and Agrostology, by the artists permanently attached to these divisions and working under the supervision of their respective chiefs. Many of the drawings thus made are intended for office use only, and not for reproduction or publication.

The work of classifying and numbering all the original cuts and

electrotypes representing the illustrations work of the Department for many years has been completed. Every cut or electrotype has been duly numbered to correspond with a number in the scrapbook in which a proof of the same is preserved for purposes of identification.

The illustrations thus prepared for every bureau and division are kept in separate scrapbooks, the electrotypes themselves being put away in numbered boxes on shelves built for the purpose, so that each one may be readily found in case of need. The number of original cuts and electros now in the type room is 10,389.

During the year 1,073 duplicates of electrotypes in the possession of the Department have been made for use in newspapers, Experiment Station bulletins, and other publications. The expense of this duplication is borne by the applicants. Sixty-two of the illustrations were duplicated in this way from two to twenty-one times.

The following is a statement of the expenditures on illustrations and artists' materials, including salaries of artists paid from general fund, showing the amount chargeable to the several divisions and aggregating $14,062.38. Outstanding and unpaid bills for work ordered during the latter part of the fiscal year will aggregate less than $500, making the total expense for the year for illustrations work $14,500, a very great reduction by comparison with former years. It should be said, however, that several artists are paid from various divisional funds, their salaries aggregating $4,500, making $20,000 as the cost of illustrations for 424 publications, as compared with $19,000 for 1891, when the number of publications issued was but little over 100.

Expenditures by divisions for illustrations, fiscal year ending June 30, 1897.

Division.	Number of illustrations.	Cost of illustrations and artists' materials.	Artists' salaries.	Total.
Agricultural Soils	29	$36.99		$36.99
Agrostology	1,043	561.81	a $1,400.00	1,961.81
Animal Industry	199	135.90	b 439.90	575.80
Biological Survey	19	152.64	c 1,200.00	1,352.64
Botany	179	387.83		387.83
Chemistry	12	16.74		16.74
Entomology	430	1,625.66		1,625.66
Experiment Stations	98	138.15		138.15
Fiber Investigations	130	247.73		247.73
Forestry	22	16.55		16.55
Office of Secretary	120	232.56		232.56
Pomology			d 1,200.00	1,200.00
Publications:				
Artists' materials		459.05		459.05
Salaries of 8 artists not assigned to divisions			5,494.22	5,494.22
Road Inquiry	10	42.75		42.75
Statistics	3	5.34		5.34
Vegetable Physiology and Pathology	87	236.10		236.10
Weather Bureau	23	32.46		32.46
Total	2,404	4,328.26	9,734.12	14,062.38

a L. S. Williams. b W. H. Dennis. c Frank Muller. d D. G. Passmore.

It is proper to refer in this connection to the special work of Miss Amanda Newton, who since her assignment to this division, in November, 1896, has made models in wax of 313 new specimens of vegetables and fruits and repaired 40 old models of melons, vegetables, etc., most of which are now on exhibition in the Department museum. Some of her work was selected for exhibition at the

Tennessee Centennial Exposition. This wax modeling is a new feature in the work of the Section of Illustrations.

CORRESPONDENCE.

The correspondence of the division has been very heavy during the past year, and sufficient, in addition to the time of those who conduct it, to keep two stenographers and typewriters constantly employed, notwithstanding the adoption of blanks calling for a minimum of writing in the case of the most purely routine matter. No actual account, except for a week at a time occasionally, has been kept of the letters received and sent from the division, but during the periods when such an account was kept the record exceeded (some weeks very considerably) 500 letters a week received and as many written and sent out. There seems to be no likelihood of a probable diminution in this part of our work. On the contrary, everything points to a steady increase. The necessity for a modification of our methods of distribution, a necessity due to the extraordinary growth of our publication work, even in spite of every effort to restrict it, and to the limits placed upon it by our appropriations, has been a prolific source of increased correspondence, involving some explanation to every applicant.

MONTHLY LIST OF PUBLICATIONS.

Owing to the varied character and in some cases narrow limits of the editions of certain publications, such limits being imposed by law, it is unadvisable and indeed impossible to keep a list of names to receive all our publications. Every applicant for Department publications is entered on a list to receive every month our circular giving the titles of all publications issued during the month. Beginning at first with an edition of a few thousand, the demand for this list of publications has increased rapidly, and we now mail it regularly to upward of 25,000 persons, each one of whom is thus enabled to obtain promptly such as he requires. In cases where a price is attached to a publication it is quoted in this list and instructions are given for applying and remitting in such cases to the Superintendent of Documents, or, in the case of certain publications of the Weather Bureau, to the Chief of that Bureau.

METHODS OF DISTRIBUTION.

It long ago became patent that the methods of distribution of our publications erstwhile pursued must give way before the rapidly increasing demand and the impossibility of supplying every applicant with everything he asked for, even if such a course had been a wise one, as some people contend. Moreover, the old plan, where the only scheme of distribution was to send out every publication to everyone that asked for it until the supply was exhausted, and then, if the funds permitted, to order a reprint, resulted in much larger editions being ordered than now; and, as no one can with certainty foretell the future demand for any publication, in the cases where the probable demand was overestimated, large quantities of documents remained on hand undistributed, and therefore valueless, yet grievously cumbering our crowded quarters; and this, too, while of other publications the supply was exhausted and the demand still kept up.

As a result of this course, pursued during more than thirty years,

over 150 sacks of publications are to-day awaiting transfer to the Superintendent of Documents, in accordance with section 67 of the act for the public printing and binding, approved January 12, 1895. These accumulations the Superintendent of Documents declares himself unable to receive for want of storage room, and as the law distinctly orders them transferred to him, it would seem that the responsibility of storing them should not devolve upon this Department; nor, indeed, can the Department lawfully incur expense to provide for their suitable storage.

The plan at present pursued is to arrange a scheme of distribution with the author or chief of division under whose directions a bulletin has been prepared, and then, allowing a few hundred copies for binding and special distribution and a small supply for the Superintendent of Documents, the size of the edition is decided upon. By this means comparatively few recent publications have accumulated to excess in our hands, all those having claims on the Department have been satisfied, and the promiscuous distribution is largely restricted to those who are willing to pay the small price affixed to the publications by the Superintendent of Documents.

SALE OF PUBLICATIONS.

Through the courtesy of the officer above mentioned I am able to state here that the total number of publications of this Department sold from his office during the last fiscal year amounted approximately to 13,000, being about four-fifths in number of his total sales, for which he received $1,775, or about two-fifths of the total amount of his sales. The average price of our publications is thus shown to be a fraction over 13½ cents per copy.

The figures for last year were—copies sold, 2,818; amount received, $353.10.

While by comparison with the enormous free distribution still made, in spite of all limitations and restrictions, the number of bulletins sold is trifling, still the increase from 1896 to 1897 is significant as showing a marked growth in the tendency of the public to avail itself of an opportunity to obtain Government publications by purchase. That tendency would unquestionably be greatly increased were the regulations of the Department in regard to free distribution more strict and more rigidly enforced, a course which I earnestly recommend as affording the only practical and equitable solution of the difficulty attending the question of distribution of Government publications.

RECOMMENDATIONS.

It is clear from a consideration of the foregoing facts that while the work of the Publications Division, embracing editing, preparation of matter for printing, indexing, proof reading, keeping of accounts, illustrations, and distribution of publications and documents, has necessarily greatly increased as the work of the Department has been enlarged and new divisions created, the provisions for doing the work have not been increased correspondingly. The efforts made during the past three years to meet enlarged demands without enlarged [illegible] have been constant and have met with no small measure of [illegible] quite impossible to overcome entirely the inequality [illegible] work and our resources, and the result has been emb[illegible] which has been felt in many quarters.

COMPARISONS OF EXPENSES.

In the last report of this division it was shown that in 1891, with a total printing fund, including the branch office, of $52,400, the work of the editing room, the illustrations, and distribution, also for artists' material and material for the document room, was provided for with appropriations aggregating $35,200, while the same work in 1896, with a total printing appropriation, including $50,000 for Farmers' Bulletins, of $140,400, nearly 200 per cent more than in 1891, did not cost to exceed $42,340, an increase of less than 25 per cent. For the fiscal year just elapsed the appropriations were exactly the same as in 1896, and for the current fiscal year ending June 30, 1898, they are slightly less, an addition to the statutory roll of places aggregating $4,920 having been offset by a reduction in the appropriation for Farmers' Bulletins and miscellaneous purposes of $5,000—that is, from $70,000 last year to $65,000 for the current year.

The total demands of Senators and Representatives for Farmers' Bulletins aggregated last year nearly two million copies, which would no doubt be exceeded this year did our appropriation permit. The cost of that number of copies at 1.4 cents apiece aggregates $28,000, and under the law half as many more should be the quota of the Department—a quota for which a legitimate demand exists—making, for printing of Farmers' Bulletins alone not less than $42,000, so that the estimate I submit herewith for the twelve months ending June 30, 1899, of $50,000 for preparation and printing Farmers' Bulletins, is strictly within reasonable limits.

Last year and the year previous, aside from that portion of the executive documents distributed from the Senate and House folding rooms, over 6,000,000 publications were received, shelved, wrapped, and distributed from the Document and Folding Room of this Department, many millions of franks were written and counted, and, according to the requirements of the present law, every one of the Farmers' Bulletins must be separately wrapped and the envelope stamped with the name of the bulletin it contains. None but those who have handled articles by the million fully realize what an enormous quantity is represented by those figures, and it must be remembered that while the vast number of documents so handled consists chiefly of pamphlets containing but a few pages, yet the handling and addressing of each one is just as much work as though it were many times as big.

INADEQUACY OF PRESENT APPROPRIATION.

In 1895 and 1896, the amount spent for printing Farmers' Bulletins being much less than in 1897, and the terms of the act of appropriations permitting expenditure for labor in distribution from the appropriation for Farmers' Bulletins, the entire cost of distributing Farmers' Bulletins was defrayed from that fund, while the increasing cost of the distribution of other publications was met by repeated drafts upon the force of other divisions.

Last year, owing to the great increase in the Farmers' Bulletin service, this latter method was pushed to the extreme limit, and resulted in greatly burdening other rolls with persons employed in this division, to an extent, indeed, which proved not only burdensome, but exceedingly unsatisfactory.

For the current year similar methods must perforce be pursued, but in spite of every effort it seems impossible to avoid great delay and embarrassment in the distribution of publications and other documents. Many of these must be distributed promptly or be rendered

absolutely valueless, such for instance as the Monthly Crop Reports—aggregating considerably over 2,000,000 copies—and the circulars of inquiry of the Statistical Division, aggregating altogether over 3,000,000 pieces. In addition to these, all the mailing of circulars of various kinds for the several bureaus and divisions and for the Secretary's office must be handled in the document room of this division. Add to all this the constantly increasing labor entailed by our effort to carry out effectively the requirements of section 92 of the act of January 12, 1895, already cited (p. 32), and the vast increase of labor imposed by lack of adequate accommodations, which necessitates the frequent handling of publications not once or twice, but three, four, and even half a dozen times, and it will be seen that, while the labor employed need not be expert, it must be ample.

It is also extremely desirable that the division should not be dependant upon a force made up largely of assignments from other divisions, and necessarily liable to be extremely shifting in its character. In fact, the increase of work in other divisions, and the limit of their appropriations, makes it more and more difficult to obtain their assistance in the manner indicated, and in view of the fact that the work of publication and the distribution of publications represent one of the two great divisions of the work of the Department, as defined in the organic law creating it, it seems obviously reasonable that it should be provided for liberally, at least proportionately to the other divisions and bureaus of which it necessarily serves as a mouthpiece.

It has already been necessary two or three times during the past few months to discharge a number of persons, although faithfully performing the work assigned to them and while the condition of the work required their services, solely from want of funds to pay them.

In the estimates submitted for the next fiscal year, therefore, the sum of $50,000 is included for the preparation and printing of Farmers' Bulletins, and $70,000 for illustrations, indexing, pay of artists, draftsmen, engravers, artists' material, etc., and for labor and material in connection with the work of distributing documents.

NEED OF A BUILDING.

It is with regret that the writer feels constrained to add to the difficulties of the superintendent of buildings by a request for enlarged accommodations. With the increase of the force and the large increase in the number of publications, the quarters occupied by the document section have been steadily enlarged and scattered throughout the building known as the Museum building and into one of the frame buildings in its vicinity. Four large rooms along the west end of the building are occupied for storerooms, although distant by almost the entire length of the museum from the shipping and mail- [illegible] The east half [illegible] the north front is occupied both on the [illegible] second floor [illegible] the office of the assistant in charge and [illegible] and shipping rooms—six rooms in [illegible] floor and two rooms on the second [illegible] front are also occupied by mail [illegible] publications stored in this part of the [illegible] museum, crowded as it is [illegible] ginally received and [illegible] ment. So also in [illegible] the west end of the [illegible] carried outside the [illegible] rooms. The lower

floor, two rooms, in a frame building east of the museum is also occupied as storerooms, access to the rooms above, occupied by the Forestry Division, being necessarily through one of the storerooms below, in which the stairway is placed. The storerooms in the west end of the building, being on the ground level and at the foot of a slight declivity, have at the time of heavy rain storms been flooded to the depth of several inches, to the very great detriment of publications stored in these rooms, many having to stand on the floor owing to lack of room.

When, in addition to all these disadvantages, the carrying to and fro of publications and the frequent rehandling made necessary by the crowded condition of these storerooms, it is borne in mind that the buildings in which the document section of this division is thus provided for are situated in the southeast corner of the Department grounds, at a very considerable distance from the main building, containing the office of the division, some idea may be had of the immense waste of time and labor involved by these most inconvenient arrangements. In justice to the large number of persons employed in the document room, numbering over 70 in all, it should be stated that the accommodations provided are not and never were fit for continued occupancy. The building was never designed for anything but a storehouse for contributions to the Agricultural Museum. Provisions were made therein for clerks to meet emergencies, and with no intention on the part of those who planned these offices that they should be occupied otherwise than as temporary quarters. In winter time it is extremely difficult to provide them with sufficient heat; but great as is this inconvenience, it is insignificant as compared with the grave discomfort occasioned by their occupancy during the summer months. The temperature in those offices averages 6° to 8° more than in the offices in the main or statistical buildings, and is only equaled by the excessive temperature in the garret of the main building, fitted up for offices for the illustrations section of this division—a device which was also designed to meet an emergency which it was supposed would be merely temporary.

To all these inconveniences must be added the constant danger of fire in the museum building and its appurtenances, which constitute a fire trap that would not on any account be permitted to exist in any other well-governed city of the United States, and which would promptly be pronounced uninsurable by any experienced insurance inspector; and yet at this writing publications, to say nothing of other property, which have cost the Government for printing alone $100,000 at a moderate estimate, besides the vast amount of money represented by the scientific investigations and other labor involved in preparing the matter, lie exposed constantly to a risk which no prudent citizen would be willing to take for property one-hundredth part as valuable.

As this difficulty has now existed for several years, being seriously aggravated with each succeeding year, and as there seems to be no possibility with the facilities now at the disposal of the superintendent of buildings of securing better accommodations, the only solution seems to be the erection of a suitable building which shall be devoted to storerooms for the publications, the clerical offices of the document section, and the mailing and shipping rooms. Such a building could also be made to serve the purpose of relieving the pressure for space in the main building by removing thereto the artists' rooms and electrotype rooms of the section of illustrations from their present cramped quarters in the garret.

A suitable building, two stories in height, could be erected fronting on Twelfth street and extending between the alley north of the museum to the alley running south of the insectary. It is believed that the entire cost of such a building, including its necessary furnishing and equipment, would not exceed at the outside $25,000, and if immediate provision were made therefor it could be begun and completed within six months' time, and in this way accommodations could be secured in case it should be necessary to make the distribution of seed from the Department in the rooms now occupied as storerooms and shipping rooms for our publications. Even if a new building should be provided for the Department at an early day, this building would not prove useless. In the first place, even supposing that provision for a new departmental building was made during the next session of Congress, it would be several years at the best before the building was ready for occupancy; but when completed there will still be many purposes for which such an additional building as I have suggested could be used and which it would not be desirable under any circumstances to pursue in the main building, such as the painters' and carpenter shops, stables, and harness rooms, which would have to be provided for and could all be accommodated in the supplementary building, which in the meantime would serve for the occupancy of the document and illustrations sections of this division.

A SECTION OF ILLUSTRATIONS.

When the Division of Illustrations was merged into this division it was understood that, after a sufficient time had elapsed to enable a proper estimate to be made of that branch of the work and to permit of its intelligent reorganization, a regular section of illustrations, or art section, would be established in the division under a section chief, thus greatly relieving the chief of the division and his first assistant of a large amount of labor with the details of which it is impossible for them to be fully familiar. Familiarity with the various methods now in use for reproduction and for illustration, and of the styles of drawing required in order to secure the best results according to the method of reproduction to be adopted, is essential if we are to secure good results and keep expenditures for this work within reasonable limits. While adhering strictly to the rule that no illustrations should be permitted in Government publications save such as are manifestly needed to supplement the text and assist the comprehension of the reader, this very strictness implies a determination that every illustration shall be the best of its kind. To apportion among the several artists according to the particular ability of each the 3,000 drawings yearly called for, and to secure the best results with due regard to economy in their reproduction, is worthy of, and indeed urgently calls for, the constant supervision of some one thoroughly familiar with the details of such work, sufficiently an artist to be a competent judge of [illegible]ists' work and sufficiently versed in illustration work to recommend the best method of reproduction adapted to each piece of work. With a view to the [illegible] section under a competent [illegible] have included [illegible] imates.

[illegible] ATIONS.

[illegible] sale of publi- [illegible] the Department for

reprints to enable the Superintendent of Documents to supply purchasers. As before stated, it is a very difficult matter to estimate exactly the future demand for a particular publication. The number usually reserved for future use, in ordering the first edition, varies from 200 or 300 to 1,000 copies, of which 100 are immediately sent to the superintendent of documents. In most cases, where another hundred may be required, we are able to supply them, but when the edition is exhausted it frequently happens that persons desiring to purchase copies continue to apply to the superintendent of documents, who appeals, and often in vain, for a further allowance.

In some cases a reprint has been ordered for the express purpose of supplying that officer, it being extremely undesirable that the supply should be cut off while a good demand exists for a publication from persons perfectly willing to pay for it. In the case of those publications, however, which under the law are limited to 1,000 copies, we are never able to supply the Superintendent of Documents more than 50 copies originally, and no reprint is possible within the fiscal year without a special order of Congress. The consequence is that in such cases a large number of applicants send in their money only to be disappointed, while the letters of explanation returning remittances must necessarily add largely to the work of the superintendent.

Even where reprints are possible it does not seem equitable that the Department should be required to trespass on its already too narrow printing fund for the sake of supplying purchasers whose money will be returned to the Treasury, and this without being in any way credited to the Department. Since the sale of publications was begun by the Superintendent of Documents, over $2,100 has been received by that officer for publications of this Department, and had a provision existed by which reprints of publications could have been ordered by the Superintendent of Documents, with the approval of the Secretary of Agriculture, the Department printing fund would have been spared considerable expense and a very much larger number of persons, whose applications and money it has been necessary to refuse, would have been gratified by receiving publications which, it is fair to presume, would have been of special use to them. It is therefore respectfully recommended that the attention of Congress be called to the matter with a view to so amending the act of January 12, 1895, as to permit moneys received for publications by the Superintendent of Documents to be made available for necessary reprints, as above indicated.

OTHER AMENDMENTS DESIRED TO LAW RELATING TO PUBLIC PRINTING.

Another amendment urgently called for is the removal of the restriction to 1,000 copies in any one fiscal year of publications containing more than 100 octavo pages. This matter has been discussed in a previous report, and it is, moreover, so obviously detrimental to the interests both of the public and of the Department that little more need be said in favor of the removal of this restriction. The growing sentiment against a general, free, promiscuous distribution of public documents and the marked increase in the sale of our publications are evidence that reasons of economy do not justify such a limitation. It is, moreover, perfectly evident that if the number of copies of publications required for the official use of the Department, including its foreign exchanges, the press, educational establishments, libraries, and its own coworkers and correspondents, exceeds 1,000 in

the case of a publication of less than 100 pages, the edition can not possibly be restricted in the case of publications exceeding that limit to 1,000 copies only, without greatly embarrassing the Department and inflicting a positive injustice upon the Department's coworkers and special correspondents, whose services actually entitle them to such recognition as the receipt of the Department publications in which they are specially interested.

Two other restrictions now imposed under the law of January 12, 1895, should also be withdrawn. These are the limitations prescribed in sections 42 and 52 of the act in question. The first limits the number of copies of any bulletin which the Public Printer may furnish to applicants giving notice before the matter is put to press to "250 to any one applicant." It has frequently happened that the work of the Department in promulgating useful information would have been widely supplemented by various organizations interested and without expense to the Government had this limitation not existed. In other cases a little deception has defeated the purpose of the law, as it is only necessary for a party desiring 1,000 copies to send in four orders under different names for 250 each. It is earnestly to be desired that this limitation should be withdrawn, and that it should be left to the discretion of the Public Printer to decide what number of copies he can supply under certain circumstances, providing the request of the applicant be indorsed by the head of the Department from which the desired publication is issued.

The other section (No. 52) requires the Public Printer to charge for duplicating stereotype or electrotype plates not only the cost of making the plates and of the metal with the usual 10 per cent added, but also the cost of composition. It has several times happened that useful publications of this Department would have been duplicated and widely distributed if the plates had been procurable for the mere cost of reproducing them, with the 10 per cent added for handling, and there is no doubt that the withdrawal of this restriction would greatly extend the distribution of matter published by the Department in future.

A BOARD OF PUBLICATIONS.

In former reports I have had occasion to recommend the appointment of an advisory board on orthography, capitalization, etc. The publication work of the Department has, however, attained such dimensions and covers such a great variety of subjects and includes such a large number of writers, many of them scientific men of eminence in their [illegible] veral lines, that it is believed that a board of publi- [illegible] ations to ac[illegible] n an advisory capacity to the editor and chief of this [illegible] ivision, and [illegible] ld be invested by the Secretary with certain [illegible] risdiction [illegible] the authors or chiefs of division and the [illegible] dite[illegible] ld satisfactorily solve many little differ [illegible] ences [illegible] course of the work, and would tend to [illegible] ha pa[illegible] of the Secretary, to whom [illegible] her party feels [illegible] [illegible] d to capitali [illegible] ary, as the resul[illegible] [illegible] opting different [illegible] ent[illegible] ver of some of

its scientific workers that this variation in style, spelling, etc., is perfectly justifiable under the circumstances, some going so far as to justify such variations in the same volume, where, as in the Yearbook, contributions are made from the several different divisions, emphasizes the need of such an advisory board.

Such lack of uniformity in a Government publication must to the average layman appear in the highest degree absurd, but apart from this consideration the existence of several varying styles in the publications of different divisions involves considerable waste of time and useless expenditure of money, both in this division and in the Government Printing Office, owing to the numerous changes to which these varying styles give rise.

CONCLUSION.

In closing this report for the fiscal year ending June 30, 1897, the writer desires to bear testimony to the satisfactory character of the services rendered by his subordinates. A very large amount of work, larger than ever before, has been handled in the division, and, I am thankful to say, to the satisfaction of my superior officers. To thus dispose satisfactorily of such an amount of work, in course of which we are called into close relations with all the bureaus and divisions of the Department, has tested the capacity, willingness, and courtesy of every member of the force. The chief consideration with all has been the interest of the service; every demand for extra time has been cheerfully and promptly met by the employees, and in very few instances has the usual term of leave of absence been enjoyed owing to the pressure of work in the division. It is only just that I should make special mention in this connection of my first assistant, Mr. Joseph A. Arnold, whose ability and painstaking, indefatigable service call for definite recognition in the form of increased remuneration. In the estimates submitted for your consideration, I propose, therefore, an increase in the salary of this gentleman from $1,800 to $2,000 per annum.

APPENDIX.

PUBLICATIONS ISSUED DURING THE YEAR ENDING JUNE 30, 1897.

(The following publications were issued during the year ending June 30, 1897. Those to which a price is attached, with the exception of publications of the Weather Bureau, must be obtained of the Superintendent of Documents, Union Building, Washington, D. C., to whom were turned over all copies not needed for official use, in compliance with section 67 of the act providing for the public printing and binding and the distribution of public documents. Remittances should be made to him by postal money order. Applications for those that are for free distribution should be made to the Secretary of Agriculture, Washington, D. C.)

OFFICE OF THE SECRETARY.

	Copies.
The World's Markets for American Products—Norway. Pp. 68, 1 map. Bulletin No. 7, Section of Foreign Markets. July, 1896. Price 5 cents	4,000
The World's Markets for American Products—Belgium. Pp. 90. Bulletin No. 6, Section of Foreign Markets. (Reprint.) December, 1896. Price 5 cents	500
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Storm Bulletin No. 5, 1896. Hurricane of September 29 and 30, 1896. October, 1896	2,300
Report of the International Meteorological Congress, held at Chicago, Ill., August 21–24, 1893, under the auspices of the Congress Auxiliary of the World's Columbian Exposition. Bulletin II, Part 3. Pp. xix–xxi, 585–772, pls. xxvi–xliii, fig. 1. Edited by Oliver L. Fassig, Secretary, November, 1896. Price 20 cents	1,000
Report of the Chief of the Weather Bureau for 1896. By Willis L. Moore. Pp. i–iii, 243–266, from Report of the Secretary of Agriculture in Message and Documents. February, 1897	8,000
Part I. New Work; Aerial Investigations. Pp. ix–xl, charts 8, from Annual Report of the Chief of the Weather Bureau for 1895–96. April, 1897	500
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Storm, Storm Tracks, and Weather Forecasting. Prepared under direction of Willis L. Moore, Chief of Weather Bureau, by Frank H. Bigelow, Professor of Meteorology. Pp. 87, charts 20. Bulletin No. 20. February, 1897. Price 10 cents	2,000
Daily River Stages at River Gauge Stations on the Principal Rivers of the United States. Part V for the years 1893, 1894, and 1895. Prepared under direction of Willis L. Moore, Chief of Bureau, by Park Morrill, forecast official. Pp. i–lxii, 1–555. (Weather Bureau, No. 112.) Quarto. June, 1897	150
Instructions for Volunteer Observers. Prepared under the direction of Willis L. Moore, Chief of the Weather Bureau. Pp. 23, figs. 10. June, 1897	5,000
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REPORT IN DETAIL OF THE DISTRIBUTION OF DOCUMENTS FROM OCTOBER 16, 1896, TO JUNE 30, 1897.

OFFICE OF THE SECRETARY.

Report of the Secretary of Agriculture, 1896. (Preliminary.) Pp. 51.

To delivery		60,000
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By legations in Washington	34	
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By newspaper list	552	
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		52,193
Balance		7,807

Report of the Secretary of Agriculture; being part of the Message and Documents communicated to the two Houses of Congress at the beginning of the Fifty-fourth Congress. Pp. 317.

To delivery		3,000
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By miscellaneous	1,572	
		2,272
Balance		728

Report of the Appointment Clerk. Pp. 267–269, Message and Documents, Department of Agriculture, 1896.

To delivery		500
By office of Appointment Clerk	100	
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		150
Balance		350

White Pine Timber Supplies. Letter from the Secretary of Agriculture, transmitting to the Senate a report on the probable amount of white and other coniferous timber standing and its consumption in the United States. (Senate Document No. 40, Fifty-fifth Congress, first session.)

To delivery		5,000
By Library list	187	
By Division of Forestry	750	
By Division of Forestry list	3,763	
By miscellaneous	300	
		5,000

Work and Expenditures of Agricultural Experiment Stations. A Report by A. C. True, Director of the Office of Experiment Stations. Pp. 68. (Senate Document No. 137, Fifty-fourth Congress, second session.)

To delivery		2,000
By Secretary's reserve	200	
By Experiment Stations	100	
By Experiment Stations list	1,121	
By Library list	198	
By miscellaneous	2	
		1,621
Balance		379

Report of the Special Agent on Seed Distribution. Pp. 155-237, Message and Documents, Department of Agriculture, 1896.

To delivery		250
By special agent	100	
By United States Senators	89	
By miscellaneous	38	
		227
Balance		23

The Mississippi River Flood. Pp. 6, fig. 1. (Miscellaneous Circular No. 2.)

To delivery		5,000
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By legations in Washington	34	
By Senators and Representatives	444	
By Division of Statistics	250	
By Library list	187	
By Hon. J. M. Robinson, M. C	200	
By Experiment Stations list	124	
By miscellaneous	169	
		1,454
Balance		3,456

DIVISION OF ACCOUNTS AND DISBURSEMENTS.

Report of the Chief of the Division of Accounts and Disbursements. Pp. 71-82, Message and Documents, Department of Agriculture, 1896.

To delivery		250
By Division of Accounts and Disbursements	200	
By miscellaneous	2	
		202
Balance		48

DIVISION OF AGRICULTURAL SOILS.

Report of the Chief of the Division of Agricultural Soils. Pp. 239-242, Message and Documents, Department of Agriculture, 1896.

To delivery		500
By Division of Agricultural Soils	100	
By miscellaneous	1	
		101
Balance		399

An Electrical Method of Determining the Moisture Content of Arable Soils. By Milton Whitney, Frank D. Gardner, and Lyman J. Briggs. Pp. 26, figs. 6. (Bulletin No. 6.)

To delivery		1,500
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By Division of Agricultural Soils	200	
By other divisions	13	
By Experiment Stations list	720	
By Division of Agricultural Soils list	159	
By miscellaneous	20	
		1,312
Balance		188

An Electrical Method of Determining the Temperature of Soils. By Milton Whitney and Lyman J. Briggs. Pp. 15, fig. 1. (Bulletin No. 7.)

To delivery		1,500
By Secretary's reserve	200	
By Division of Agricultural Soils	200	
By legations in Washington	34	
By other divisions	12	
By Division of Agricultural Soils list	249	
By Experiment Stations list	565	
By miscellaneous	3	
		1,263
Balance		237

An Electrical Method of Determining the Soluble Salt Content of Soils, with Some Results of Investigations on the Effect of Water and Soluble Salts on the Electrical Resistance of Soils. By Milton Whitney and Thomas H. Means. Pp. 30, figs. 6. (Bulletin No. 8.)

To delivery		1,500
By Secretary's reserve	200	
By Division of Agricultural Soils	200	
By other divisions	12	
By legations in Washington	34	
By Division of Agricultural Soils	249	
By Experiment Stations list	565	
By miscellaneous	2	
		1,262
Balance		238

DIVISION OF AGROSTOLOGY.

Report of the Agrostologist. Pp. 103-108, Message and Documents, Department of Agriculture, 1896.

To delivery		250
By Division of Agrostology	100	
By miscellaneous	1	
		101
Balance		149

Useful and Ornamental Grasses. By F. Lamson-Scribner, Agrostologist. Pp. 119, figs. 89. (Bulletin No. 3.)

To delivery		1,000
By Superintendent of Documents	100	
By Division of Agrostology	200	
By other divisions	44	
By legations in Washington	31	
By Secretary's reserve	150	
By divisional list	101	
By Library list	300	
By Weather Bureau	38	
By miscellaneous	36	
		1,000

Studies in American Grasses. Pp. 43, pls. 5, figs. 15. (Bulletin No. 4.)

To delivery		2,000
By Secretary's reserve	200	
By Division of Agrostology	200	
By Superintendent of Documents	100	
By legations in Washington	34	
By other divisions	21	
By divisional list	369	
By Library list	189	
By miscellaneous	216	
		1,329
Balance		671

A report upon the Grasses and Forage Plants of the Rocky Mountain Region. By P. L. Rydberg and C. L. Shear. Pp. 48, figs 29. (Bulletin No. 5.)

To delivery		2,000
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By Division of Agrostology	200	
By Secretary's reserve	200	
By other divisions	26	
By legations in Washington	34	
By Division of Agrostology	100	
By divisional list	933	
By Library list	198	
By miscellaneous	12	
		1,803
Balance		197

Grasses and Forage Plants of the Dakotas. Compiled by Thomas A. Williams. Pp. 47, figs. 11. (Bulletin No. 6.)

To delivery		5,030
By Superintendent of Documents	100	
By Secretary's reserve	200	
By Division of Agrostology	200	
By other divisions	20	
By legations in Washington	34	
By Library list	189	
By divisional list	63	
By Experiment Stations list	125	
By miscellaneous	2,644	
		3,575
Balance		1,455

American Grasses. By F. Lamson-Scribner, Agrostologist. Pp. 331, figs. 302. (Bulletin No. 7.)

To delivery		1,006
By Superintendent of Documents	50	
By Division of Agrostology	210	
By Library list	178	
By newspaper list	122	
By divisional list	57	
By Experiment Stations list	57	
By miscellaneous	52	
		726
Balance		280

Studies on American Grasses. I. New or Little Known Grasses. By F. Lamson-Scribner. II. Leaf Structure of Jouvea and Eragrostis obtusiflora. By Miss E. L. Ogden. Pp. 23, pls. 9, fig. 1. (Bulletin No. 8.)

To delivery		1,000
By Secretary's reserve	200	
By Superintendent of Documents	100	
By Division of Agrostology	200	
By other divisions	10	
By legations in Washington	34	
By divisional list	282	
By Library list	156	
By miscellaneous	18	
		1,000

BUREAU OF ANIMAL INDUSTRY.

Report of the Chief of the Bureau of Animal Industry. Pp. 8. Message and Documents, Department of Agriculture, 1896.

To delivery		500
By Bureau of Animal Industry	100	
By miscellaneous	5	
		105
Balance		395

Twelfth and Thirteenth Annual Reports of the Bureau of Animal Industry for the Fiscal Years 1895 and 1896. Pp. 262, pls. 38, figs. 4.

To delivery		8,800
By Division of Publications	25	
By Bureau newspaper list	55	
By Experiment Stations	178	
By Bureau l[illegible]	928	
By newspaper l[illegible]	309	
By Dairy Divis[illegible]	20	
By Dairy Divis[illegible]	2,027	
By Library	178	
By miscel[illegible]	48	
		4,868
[illegible]		3,932

Tuberculosis Investigations. The Growth of the Tuberculosis Bacillus upon Acid Media. By E. A. de Schweinitz and Marion Dorset.—Further Experiments with an Attenuated Tuberculosis Bacillus. By E. A. de Schweinitz and E. C. Schroeder.—The Effect of Tuberculin Injections upon the Milk of Healthy and Diseased Cows. By E. A. de Schweinitz. Prepared under the direction of Dr. D. E. Salmon, Chief of the Bureau of Animal Industry. Pp. 27, pls. 2, figs. 7. (Bulletin No. 13.)

To delivery		2,500
By Superintendent of Documents	100	
By Bureau of Animal Industry	450	
By other divisions	44	
By Secretary's reserve	200	
By Experiment Stations list	125	
By Library list	300	
By Bureau lists	1,228	
By miscellaneous	6	
		2,453
Balance		47

Dairying in California. By Prof. E. J. Wickson, M. A., University of California, under the direction of Dr. D. E. Salmon, Chief of the Bureau of Animal Industry. Pp. 31, map 1. (Bulletin No. 14.)

To delivery		8,000
By Superintendent of Documents	100	
By Bureau of Animal Industry	200	
By other divisions	44	
By legations in Washington	31	
By newspaper list	499	
By Dairy Division list	1,600	
By Dairy Division	300	
By Bureau lists	1,912	
By Library list	300	
By miscellaneous	2,202	
		7,188
Balance		812

The Cheese Industry of the State of New York. By B. D. Gilbert, Special Expert Agent, Dairy Division, under the direction of Dr. D. E. Salmon, Chief of the Bureau of Animal Industry. Pp. 54. (Bulletin No. 15.)

To delivery		10,000
By Secretary's reserve	200	
By Bureau of Animal Industry	200	
By other divisions	13	
By Superintendent of Documents	100	
By legations in Washington	34	
By newspaper list	559	
By Library list	189	
By miscellaneous	8,235	
		9,530
Balance		470

The Dairy Industry in Nebraska, South Dakota, and North Dakota. By John H. Monrad, Special Agent. Pp. 21. (Bulletin No. 16.)

To delivery		4,500
By Secretary's reserve	200	
By Bureau of Animal Industry	300	
By other divisions	22	
By Superintendent of Documents	100	
By legations in Washington	35	
By newspaper list	559	
By Library list	182	
By miscellaneous	3,102	
		4,500

Dairy Schools. By R. A. Pearson, B. S., Assistant Chief of Dairy Division, under the direction of Dr. D. E. Salmon, Chief of the Bureau of Animal Industry. Pp. 38, pls. 4, figs. 2. (Bulletin No. 17.)

To delivery		10,000
By Secretary's reserve	200	
By Bureau of Animal Industry	200	
By other divisions	10	
By Superintendent of Documents	100	
By Bureau list	916	
By Library list	189	
By miscellaneous	8,351	
By legations in Washington	34	
		10,000

Exports of Animals and Their Products. By Dr. D. E. Salmon, Chief of the Bureau of Animal Industry. Pp. 3. (Circular No. 17.)

To delivery		10,000
By Secretary's reserve	200	
By Bureau of Animal Industry	200	
By other divisions	34	
By Superintendent of Documents	100	
By legations in Washington	34	
By newspaper list	600	
By Library list	183	
By miscellaneous	1,146	
		2,497
Balance		7,503

List of Officials and Associations Connected with the Dairy Interests in the United States and Canada for 1897. Pp. 8. (Circular No. 18.)

To delivery		10,000
By Dairy Division lists	2,040	
By other divisions	48	
By Library list	178	
By miscellaneous	100	
		2,366
Balance		7,634

Factory Cheese and How It is Made. By G. Merry, of Verona, N. Y. Pp. 8. (Circular No. 19.)

To delivery		5,000
By Secretary's reserve	200	
By Bureau of Animal Industry	200	
By legations in Washington	34	
By other divisions	25	
By Dairy Division	500	
		959
[illegible]		4,041

[illegible] Message and

[illegible]		250
[illegible]	00	
[illegible]		105
[illegible]		145

Bird Day in the Schools. By T. S. Palmer, Acting Chief of Division. Pp. 4. (Circular No. 17.)

To delivery		15,000
By Division of Biological Survey	1,000	
By normal schools in Wisconsin	12,000	
By H. E. Richards	500	
By miscellaneous	200	
		13,700
Balance		1,300

DIVISION OF BOTANY.

Report of the Botanist. Pp. 95–102, Message and Documents, Department of Agriculture, 1896.

To delivery		500
By Division of Botany	100	
By Division of Botany list	300	
By miscellaneous	4	
		404
Balance		96

Contributions from the United States National Herbarium. Vol. I, No. 5. List of plants collected by Dr. Edward Palmer in 1890 on Carman Island. By J. N. Rose. List of plants collected by the U. S. S. Albatross in 1887–1891 along the western coast of America. By J. N. Rose, D. C. Eaton, J. W. Eckfeldt, and A. W. Evans. Revision of the North American species of Hoffmanseggia. By E. M. Fisher. Systematic and alphabetic index of new species of North American Phanerogams and Pteridophytes, published in 1891. By Josephine A. Clark. Pp. v, 129–188, pls. xii–xvi. Reprint.

To delivery	100
By Superintendent of Documents	50
Balance	50

Contributions from the United States National Herbarium, Vol. I, No. 7. Systematic and alphabetic index to the new species of North American Phanerogams and Pteridophytes published in 1892. By Josephine A. Clark. Pp. iii, 233–264. Reprint.

To delivery	100
By Superintendent of Documents	50
Balance	50

Contributions from the United States National Herbarium, Vol. I, No. 6. I—List of plants collected by C. S. Sheldon and M. A. Carleton in the Indian Territory in 1891. By J. M. Holtzinger. II—Observations on the native plants of Oklahoma Territory and adjacent district. By M. A. Carleton. Pp. v, 189–232, pls. xvii and xviii. Reprint.

To delivery	100
By Superintendent of Documents	50
Balance	50

Contributions from the United States National Herbarium, Vol. III, No. 2. Preliminary Revision of the North American Species of Cactus, Anhalonium, and Lophophora. By John M. Coulter. Pp. 91–132. Reprint.

To delivery		500
By Division of Botany	100	
By Superintendent of Documents	100	
By miscellaneous	6	
		206
Balance		294

Contributions from the United States National Herbarium, Vol. V, No. 2. Notes on the plants used by the Klamath Indians of Oregon. By Frederick V. Coville. Pp. v, 87–108.

To delivery		2,500
By Secretary's reserve	200	
By Division of Botany	200	
By other divisions	11	
By legations in Washington	31	
By Division of Botany list	232	
By Experiment Stations list	473	
By Division of Botany list	582	
y Library list	151	
		1,880
Balance		.620

The Water Hyacinth, and Its Relation to Navigation in Florida. By Herbert J. Webber. Pp. 20, pl. 1, figs. 4. (Bulletin No. 18.)

To delivery		1,465
By Secretary's reserve	200	
By Division of Botany	200	
By other divisions	22	
By legations in Washington	34	
By Division of Publications	6	
By Division of Botany list	232	
By Experiment Stations list	473	
By Library list	151	
By miscellaneous	7	
		1,325
Balance		140

Wild Garlic. By Lyster H. Dewey, Assistant in Division of Botany. Pp. 8, figs. 3. (Circular No. 9.)

To delivery		15,000
By Secretary's reserve	200	
By Division of Botany	200	
By Superintendent of Documents	100	
By other divisions	42	
By legations in Washington	34	
By newspaper list	575	
By Library list	198	
By Division of Statistics list	2,024	
By Hon. W. A. Baker, M. C	60	
By miscellaneous	11,558	
		14,991
Balance		9

[illegible] New Weeds of the Mustard Family. By Lyster H. Dewey, Assistant in Division of Botany [illegible] figs. [illegible] Circular No. 10.)

To delivery		10,000
By Division of Botany list	1,766	
By Experiment Stations list	461	
By Division of Botany list	200	
By newspaper list	593	
By other divisions	48	
By Library list	178	
By Library list	151	
By miscellaneous	201	
		3,598
[illegible]		6,402

The Vitality of Seed Treated with Carbon Bisulphide. By Gilbert H. Hicks, First Assistant Botanist, and John C. Dabney, Assistant in Division of Botany. Pp. 5. (Circular No. 11.)

To delivery		10,000
By Secretary's reserve	200	
By Division of Botany	200	
By legations in Washington	34	
By newspaper list	700	
By Division of Botany list	225	
By other divisions	46	
		1,405
Balance		8,595

DIVISION OF CHEMISTRY.

Report of the Chief of the Division of Chemistry. Pp. 9–14, Message and Documents, Department of Agriculture, 1896.

To delivery		250
By Division of Chemistry	100	
By miscellaneous	3	
		103
Balance		147

Proceedings of the Thirteenth Annual Convention of the Association of Official Agricultural Chemists, held at Washington, D. C., November 6, 7, and 9, 1896. Edited by Harvey W. Wiley, Secretary of the Association. Pp. 127, figs. 5. (Bulletin No. 49.)

To delivery		2,020
By Secretary's reserve	200	
By Division of Chemistry	200	
By other divisions	17	
By legations in Washington	34	
By Superintendent of Documents	100	
By Library list	187	
By Experiment Stations list	878	
By miscellaneous	108	
		1,724
Balance		296

Changes in and Additions to Methods of Analysis Adopted at the Thirteenth Annual Meeting of the Association of Official Agricultural Chemists. Pp. 6. (Circular No. 2.)

To delivery		2,000
By Secretary's reserve	200	
By Division of Chemistry	200	
By Superintendent of Documents	50	
By Library list	183	
By Experiment Stations list	125	
By Division of Chemistry	800	
By miscellaneous	54	
		1,612
Balance		388

Methods of Analysis Adopted by the Association of the Official Agricultural Chemists, September 5, 6, and 7, 1895. Edited by Harvey W. Wiley, Secretary, with the collaboration of L. L. Van Slyke and W. D. Bigelow, editorial committee. Pp. 84, figs. 4. (Bulletin No. 46.) Reprint.

To delivery		500
By Division of Chemistry	300	
By Superintendent of Documents	100	
By miscellaneous	10	
		410
Balance		90

DIVISION OF ENTOMOLOGY.

Report of the Entomologist. Pp. 89–93, Messages and Documents, Department of Agriculture, 1896.

To delivery		250
By Division of Entomology	100	
By miscellaneous	4	
		104
Balance		146

Bibliography of the More Important Contributions to American Economic Entomology. By Samuel Henshaw. Part V—The More Important Writings of Government and State Entomologists and other Contributions to the Literature of American Economic Entomology. L–Z. Pp. 179.

To delivery		1,000
By Secretary's reserve	200	
By Division of Entomology	75	
By other divisions	8	
By Library list	183	
By foreign list	134	
By miscellaneous	400	
		1,000

General Index to the Seven Volumes of Insect Life. Pp. 145.

To delivery		1,000
By Division of Entomology	278	
By Division of Entomology list	268	
By miscellaneous	12	
		558
Balance		442

The Plum Plant Louse (*Myzus mahaleb* Fonsc.). By Theodore Pergande. (Reprinted from Bulletin No. 7, new series.)

To delivery		100
By Division of Entomology		100

The Use of Steam Apparatus for Spraying. By L. O. Howard, Ph. D., Entomologist. Pp. 69–88, pls. 2, figs. 15, from Yearbook for 1896.

To delivery		1,000
By Division of Entomology		1,000

The Asparagus Beetles. By F. H. Chittenden, Assistant Entomologist. Pp. 341–352, figs. 6, from Yearbook for 1896.

To delivery		2,000
By Division of Entomology	1,200	
By Library list	85	
		1,285
Balance		715

Insect Control in California. By C. L. Marlatt, First Assistant Entomologist. Pp. 217–236, pl. 1, figs. 2, from Yearbook for 1896.

To delivery		7,000
By Division of Entomology	200	
By Hon. C. A. Barlow, M. C	5,000	
By Library list	85	
		5,285
Balance		1,715

The Ambrosia Beetles of the United States. By H. G. Hubbard. Pp. 9–30, figs. 34, from Bulletin No. 7, new series.

To delivery		100
By Division of Entomology		100

The Principal Household Insects of the United States. By L. O. Howard and C. L. Marlatt. With a Chapter on Insects Affecting Dry Vegetable Foods, by F. H. Chittenden. Pp. 130, figs. 64. (Bulletin No. 4, new series.)

To delivery		5,000
By Division of Entomology	650	
By Superintendent of Documents	250	
By other divisions	44	
By legations in Washington	31	
By Secretary's reserve	200	
By newspaper list	499	
By Experiment Stations list	125	
By newspaper list from Division of Entomology	96	
By foreign list	254	
By Library list	300	
By Division of Entomology list	550	
By miscellaneous	1,874	
		4,073
Balance		927

Insects Affecting Domestic Animals: An account of the species of importance in North America, with mention of related forms occurring on other animals. Prepared under the direction of the Entomologist, by Herbert Osborn, professor of zoology and entomology, Iowa Agricultural College. Pp. 302, pls. 5, figs. 170. (Bulletin No. 5, new series.)

To delivery		1,000
By Secretary's reserve	200	
By Division of Entomology	200	
By Superintendent of Documents	100	
By other divisions	16	
By Library list	189	
By Experiment Stations list	125	
By miscellaneous	170	
		1,000

Proceedings of the Eighth Annual Meeting of the Association of Economic Entomologists. Pp. 100, figs. 5. (Bulletin No. 6, new series.)

To delivery		2,000
By Secretary's reserve	200	
By Division of Entomology	200	
By Superintendent of Documents	100	
By legations in Washington	35	
By other divisions	21	
By Division of Entomology lists	721	
By Experiment Stations list	125	
By miscellaneous	142	
		1,544
Balance		456

Some Miscellaneous Results of the Work of the Division of Entomology. Prepared under the direction of L. O. Howard, Entomologist. Pp. 87, figs. 44. (Bulletin No. 7, new series.)

To delivery		3,000
By Secretary's reserve	200	
By Division of Entomology	200	
By Superintendent of Documents	100	
By other divisions	20	
By legations in Washington	34	
By newspaper list	575	
By Experiment Stations list	125	
By Library list	189	
By miscellaneous	722	
		2,165
Balance		835

Some Little-known Insects Affecting Stored Vegetable Products: A Collection of Articles Detailing Certain Original Observations Made upon Insects of this Class. By F. H. Chittenden, Assistant Entomologist. Pp. 45, figs. 10. (Bulletin No. 8, new series.)

To delivery		2,000
By Secretary's reserve	200	
By Division of Entomology	200	
By other divisions	20	
By legations in Washington	35	
By Experiment Stations list	125	
By Division of Entomology lists	691	
By Library list	198	
By miscellaneous	43	
		1,512
Balance		488

A Study in Insect Parasitism: A Consideration of the Parasites of the White-marked Tussock Moth, with an account of their habits and interrelations, and with descriptions of new species. By L. O. Howard, Entomologist. Pp. 57, figs. 24. (Bulletin No. 5, technical series.)

To delivery		1,500
By Secretary's reserve	200	
By Division of Entomology	200	
By Superintendent of Documents	100	
By other divisions	9	
By legations in Washington	35	
By Experiment Stations list	125	
By Division of Entomology lists	624	
By Library list	187	
By miscellaneous	20	
		1,500

The Mexican Cotton-boll Weevil. By L. O. Howard, Entomologist. Pp. 8, figs. 5. (Circular No. 18.)

To delivery		5,000
By Secretary's reserve	200	
By Division of Entomology	250	
By Superintendent of Documents	100	
By other divisions	22	
By legations in Washington	34	
By Division of Entomology list	1,000	
By Experiment Stations list	125	
By Library list	189	
By miscellaneous	25	
		1,945
Balance		3,055

The Mexican Cotton-boll Weevil. By L. O. Howard, Entomologist. Pp. 11, figs. 5. (Circular No. 18.) German edition.

To delivery		1,537
By Division of Entomology	1,309	
By Library list	187	
		1,496
[illegible]		41
[illegible] Mexican [illegible]-boll Weevil [illegible] Entomologist. Pp. [illegible]0, figs. [illegible] Circular [illegible]8. Spanish edition		
To deliv[illegible]		500
By Secretary's [illegible]	[illegible]	
By Division o[illegible]	[illegible]	
By other divi[illegible]	[illegible]	
By legations [illegible] Washington	[illegible]	
By Div[illegible] Entomology [illegible]	[illegible]	
		[illegible]00

The Clover Mite. By. C. L. Marlatt, Assistant Chief of Division of Entomology. Pp. 4, fig. 1. (Circular No. 19.)

To delivery		3,500
By Secretary's reserve	200	
By Division of Entomology	200	
By other divisions	40	
By legations in Washington	35	
By newspaper list	575	
By Experiment Stations list	125	
By Library list	198	
By Division of Entomology list	434	
By miscellaneous	200	
		2,007
Balance		1,493

The Woolly Aphis of the Apple. By C. L. Marlatt, First Assistant Entomologist. Pp. 6, figs. 2. (Circular No. 20.)

To delivery		3,800
By Secretary's reserve	200	
By Division of Entomology	200	
By other divisions	38	
By legations in Washington	34	
By Division of Entomology list	434	
By Library list	187	
By Experiment Stations list	124	
By miscellaneous	100	
		1,317
Balance		2,483

The Strawberry Weevil. By F. H. Chittenden. Pp. 7. (Circular No. 21.)

To delivery		5,000
By Division of Entomology	700	
By legations in Washington	31	
By Secretary's reserve	200	
By Prof. W. G. Johnson	200	
By Division of Entomology list	434	
By Library list	187	
By Experiment Stations list	124	
By miscellaneous	100	
		1,979
Balance		3,021

The Periodical Cicada in 1897. By E. A. Schwartz, Assistant in Division of Entomology. Pp. 4. (Circular No. 22.)

To delivery		2,500
By other divisions	48	
By Library list	178	
By miscellaneous	200	
By Experiment Stations list	124	
		550
Balance		1,950

OFFICE OF EXPERIMENT STATIONS.

Report of the Director of the Office of Experiment Stations. Pp. 123–143, Message and Documents, Department of Agriculture, 1896.

To delivery		1,500
By Experiment Stations	100	
By Experiment Stations list	975	
By miscellaneous	1	
		1,076
Balance		424

Insects Affecting the Cotton Plant. By L. O. Howard, Ph. D., Entomologist. Pp. 315–350, pl. 1, figs. 9–29, from Bulletin No. 33.

To delivery		500
By Division of Entomology	300	
By Library list	182	
By miscellaneous	18	
		500

Dairy Work at the Experiment Stations. Reprint from Experiment Station Record, Vol. 8, No. 5.

To delivery		200
By Office of Experiment Stations		200

The Cotton Plant: Its History, Botany, Chemistry, Culture, Enemies, and Uses, Prepared under the supervision of A. C. True, Ph. D., Director of the Office of Experiment Stations. With an introduction by Charles W. Dabney, jr., Ph. D., Assistant Secretary of Agriculture. Pp. 433, pls. 4, figs. 32. (Bulletin No. 33.)

To delivery		1,000
By Secretary's reserve	200	
By Experiment Stations	200	
By Superintendent of Documents	50	
By Library list	192	
By miscellaneous	358	
		1,000

(Same: Congressional reprint.)

To delivery		3,400
By Division of Publications	10	
By Experiment Stations list	1,174	
By Library list	48	
By Division of Statistics	10	
By Experiment Stations	25	
By miscellaneous	104	
		1,381
Balance		2,019

The Carbohydrates of Wheat, Maize, Flour, and Bread, and the Action of Enzymic Ferments upon Starches of Different Origin. By Winthrop E. Stone, Ph. D., Professor of Chemistry of Purdue University. Pp. 44. (Bulletin No. 34.)

To delivery		3,500
By Secretary's reserve	200	
By Experiment Stations	200	
By other divisions	15	
By legations in Washington	34	
By Library list	183	
By miscellaneous	2,474	
		3,106
[illegible]		394

[illegible] in New Jersey in 1895 and 1896. By Edward [illegible] Director New Jersey Agricultural Experiment Stations and Professor [illegible] Rutgers College [illegible] Brunswick [illegible] Pp. 40. [illegible]

[illegible]		500
Secretary [illegible]	300	
Experiment [illegible]	200	
[illegible]	100	
[illegible]	32	
Legat[illegible]	34	
[illegible]brar[illegible]	83	
[illegible]	172	
		3,411
[illegible]		89

Notes on Irrigation in Connecticut and New Jersey. By C. S. Phelps, B. S., and Edward B. Voorhees, A. M. Pp. 64, figs. 7. (Bulletin No. 36.)

To delivery		4,000
By Secretary's reserve	200	
By other divisions	8	
By Experiment Stations	200	
By Superintendent of Documents	100	
By legations in Washington	34	
By Library list	187	
By Experiment Station, New Brunswick, N. J	1,000	
By Storrs Agricultural School, Storrs, Conn	1,000	
By Experiment Stations list	662	
By G. A. Mitchell	30	
By miscellaneous	60	
		3,481
Balance		519

Dietary Studies at the Maine State College in 1895. By Whitman H. Jordan, M. S., Director Maine Agricultural Experiment Station and Professor of Agriculture, Maine State College. Pp. 57. (Bulletin No. 37.)

To delivery		4,500
By Secretary's reserve	200	
By Experiment Stations	200	
By Superintendent of Documents	100	
By legations in Washington	34	
By other divisions	13	
By Experiment Stations list	2,817	
By Library list	198	
By miscellaneous	7	
		3,569
Balance		931

Dietary Studies with Reference to the Food of the Negro in Alabama in 1895 and 1896. Conducted with the cooperation of the Tuskegee Normal and Industrial Institute and the Agricultural and Mechanical College of Alabama. Reported by W. O. Atwater and Charles D. Wood. Pp. 69, pls. 2. (Bulletin No. 38.)

To delivery		5,000
By Secretary's reserve	200	
By Experiment Stations	200	
By Superintendent of Documents	100	
By legations in Washington	34	
By other divisions	8	
By Experiment Stations list	1,317	
By W. L. Broun, Auburn, Ala	1,000	
By B. T. Washington, Tuskegee, Ala	1,000	
By Library list	145	
By Brigadier-General Sullivan	25	
By Prof. W. O. Atwater	25	
By Library list	278	
By miscellaneous	33	
		4,365
Balance		635

Organization Lists of the Agricultural Experiment Stations in the United States, and Institutions with Courses in Agriculture in the United States. Pp. 96. (Bulletin No. 39.)

To delivery		3,500
By Secretary's reserve	200	
By Experiment Stations	200	
By Superintendent of Documents	100	
By other divisions	24	
By legations in Washington	34	
By Bureau of Animal Industry	5	
By Experiment Stations list	742	
By Library list	278	
By miscellaneous	35	
		1,618
Balance		1,882

Dietary Studies in New Mexico in 1895. By Arthur Goss, M. S., Professor of Chemistry, New Mexico College of Agriculture and Mechanic Arts. Pp. 23. (Bulletin No. 40.)

To delivery		3,500
By Secretary's reserve	200	
By Experiment Stations	200	
By Superintendent of Documents	100	
By legations in Washington	35	
By other divisions	17	
By Experiment Stations lists	1,464	
By Library list	187	
By Brigadier-General Sullivan, War Department	25	
By E. W. Hilgard, California	250	
By C. T. Jordan, New Mexico	500	
By W. S. Devol, Tucson, Ariz	250	
By miscellaneous	26	
		3,254
Balance		246

Cotton Culture in Egypt. By George P. Foaden, B. S., Professor of Agriculture, Tewfikieh College of Agriculture, Ghizeh, Egypt. Pp. 34, fig. 1. (Bulletin No. 42.)

To delivery		4,000
By other divisions	21	
By Experiment Stations	200	
By legations in Washington	34	
By Section of Foreign Markets	25	
By Library list	323	
By Experiment Stations lists	1,191	
By Secretary's reserve	200	
By miscellaneous	18	
		2,012
Balance		1,988

Report of the Committee on Methods of Teaching Agriculture. Pp. 20. (Circular No. 32.)

To delivery		3,000
By Secretary's reserve	200	
By Experiment Stations	500	
By Superintendent of Documents	100	
By other divisions	44	
By legations in Washington	30	
By Library list	189	
By newspaper list	600	
By libraries in the United States	1,200	
		2,863
Balance		137

Civil Service in the Department of Agriculture. Pp. 10. (Circular No. 33.)

To delivery		5,000
By Secretary's reserve	200	
By Experiment Stations	200	
By Superintendent of Documents	100	
By other divisions	[illegible]	
By legations in Washington	[illegible]	
By miscellaneous	122	
		5,000

[illegible] (4.)

[illegible]		3,000
By Secretary's reserve	200	
By Experiment Stations	200	
By legations in Washington	[illegible]	
By other divisions	[illegible]	
By Library list	187	
By [illegible]	750	

Rules and Apparatus for Seed Testing, etc.—Continued.

By Experiment Station, Raleigh, N. C	25	
By Experiment Station, New Haven, Conn	25	
By Experiment Station, Lincoln, Nebr	25	
By Experiment Station, Columbus, Ohio	25	
By Experiment Stations list	623	
By miscellaneous	100	
		2,236
Balance		764

Constitution of the Association of American Agricultural Colleges and Experiment Stations. Pp. 4. (Circular No. 36.)

To delivery		2,000
By Secretary's reserve	200	
By Experiment Stations	200	
By legations in Washington	34	
By other divisions	28	
		462
Balance		1,538

Experiment Station Record, Vol. VII. (Bound.)

To delivery		200
By Experiment Stations list	159	
By miscellaneous	1	
		160
Balance		40

Experiment Stations Record, Vol. VII, No. 11. Pp. vi, 903–996.

To delivery		6,000
By Superintendent of Documents	100	
By Experiment Stations	200	
By other divisions	44	
By legations in Washington	31	
By Secretary's reserve	200	
By Experiment Stations list	5,020	
By Library list	300	
By miscellaneous	105	
		6,000

Experiment Station Record, Vol. VII, No. 12. Pp. 997–1092, xii.

To delivery		4,010
By Secretary's reserve	200	
By Experiment Stations	200	
By Superintendent of Documents	100	
By other divisions	20	
By legations in Washington	32	
By Experiment Stations list	2,607	
By newspaper list	553	
By Library list	189	
By miscellaneous	109	
		4,010

Experiment Station Record, Vol. VIII, No. 1. Pp. vi, 94.

To delivery		4,000
By Secretary's reserve	200	
By Superintendent of Documents	100	
By other divisions	44	
By Experiment Stations	200	
By legations in Washington	30	
By Experiment Stations list	2,757	
By miscellaneous	125	
		3,456
Balance		454

Experiment Station Record, Vol. VIII, No. 2. Pp. vi, 95–176.

To delivery		4,000
By other divisions	44	
By Superintendent of Documents	100	
By Experiment Stations	200	
By legations in Washington	30	
By Secretary's reserve	200	
By Experiment Stations list	2,185	
By newspaper list	258	
By miscellaneous	124	
		3,141
Balance		859

Experiment Station Record, Vol. VIII, No. 3. Pp. vi, 177–268.

To delivery		4,000
By other divisions	20	
By legations in Washington	32	
By Experiment Stations list	1,127	
By newspaper list	258	
By Library list	182	
By miscellaneous	1,202	
		3,821
Balance		179

Experiment Station Record, Vol. VIII, No. 4. Pp. viii, 269–354.

To delivery		4,000
By Secretary's reserve	200	
By Superintendent of Documents	200	
By Experiment Stations	200	
By other divisions	18	
By legations in Washington	32	
By Experiment Stations list	2,728	
By newspaper list	261	
By Library list	189	
By Library list	47	
By miscellaneous	18	
		3,893
Balance		107

Experiment Station Record, Vol. VIII, No. 5. Pp. vi, 355–444.

To delivery		4,000
By Secretary's reserve	200	
By Experiment Stations	200	
By Superintendent of Documents	100	
By legations in Washington	32	
By other divisions	21	
By Experiment Stations list	2,590	
By newspaper list	553	
By Library list	189	
By miscellaneous	19	
		3,904
Balance		96

Experiment Station Record, Vol. VIII, No. 6. Pp. vi, 445–538.

To delivery		4,010
By Secretary's reserve	200	
By Experiment Stations	200	
By Superintendent of Documents	100	
By other divisions	22	
By legations in Washington	35	
By Experiment Stations list	2,377	
By Library list	623	
By newspaper list	259	
By miscellaneous	12	
		3,828
Balance		182

Experiment Station Record, Vol. VIII, No. 7. Pp. vi, 539–638.

To delivery		4,000
By Secretary's reserve	200	
By Experiment Stations	200	
By Superintendent of Documents	100	
By other divisions	22	
By legations in Washington	32	
By Library list	743	
By Experiment Stations list	2,296	
By newspaper list	239	
By miscellaneous	58	
		3,890
Balance		110

Experiment Station Record, Vol. VIII, No. 8. Pp. v, 639–738.

To delivery		4,008
By other divisions	25	
By Experiment Stations list	2,183	
By Superintendent of Documents	200	
By newspaper list	260	
By Library list	591	
By Superintendent of Documents	3	
By miscellaneous	1	
		3,263
Balance		735

Experiment Station Record, Vol. VIII, No. 9. Pp. vii, 739–838.

To delivery		4,010
By Secretary's reserve	200	
By other divisions	25	
By Experiment Stations	200	
By Superintendent of Documents	200	
By legations in Washington	33	
By newspaper list	260	
By Library list	591	
By Experiment Stations list	2,213	
		3,722
Balance		288

OFFICE OF FIBER INVESTIGATIONS.

Report of the Office of Fiber Investigations. Pp. 27–28, Message and Documents, Department of Agriculture, 1896.

To delivery		250
By Office of Fiber Investigations	200	
By miscellaneous	1	
		201
Balance		49

A Report on the Culture of Hemp and Jute in the United States, with statement concerning the practice employed in foreign countries, the preparation of the fiber for market, and remarks on the machine question. By Chas. Richards Dodge, Special Agent. Pp. 43, pls. 3, figs. 4. (Report No. 8.)

To delivery		5,500
By Secretary's reserve	200	
By Office of Fiber Investigations	300	
By Superintendent of Documents	100	
By other divisions	23	
By newspaper list	559	
By foreign list	158	
By Library list	182	
By miscellaneous	3,366	
		4,888
Balance		612

SECTION OF FOREIGN MARKETS.

The World's Markets for American Products—Sweden. Pp. 92. (Bulletin No. 8.)

To delivery		4,000
By Secretary's reserve	200	
By Section of Foreign Markets	200	
By Superintendent of Documents	200	
By other divisions	44	
By legations in Washington	31	
By Foreign Markets list	2,023	
By Division of Statistics	25	
By Experiment Stations list	125	
By newspaper list	542	
By Experiment Stations newspaper list	256	
By miscellaneous	354	
		4,000

Imports and Exports for 1893–1896. Pp. 9. (Circular No. 9.)

To delivery		40,000
By other divisions	44	
By Dr. Dabney	200	
By Hon. J. Sterling Morton, Chicago, Ill	500	
By Hon. J. Sterling Morton, Nebraska City, Nebr	200	
By newspaper list	497	
By Joseph L. Brown, Mentor, Ohio	100	
By Henry Hentz, New York, N. Y	200	
By list from Assistant Secretary	944	
By Section of Foreign Markets	20,000	
By Hon. Edward Atkinson	120	
By Library list	300	
By miscellaneous	16,895	
		40,000

Course of Wheat Production and Exportation in the United States, Canada, Argentina, Uruguay, Russia, and British India, from 1880 to 1896. (Circular No. 10.)

To delivery		50,000
By Secretary's reserve	200	
By Superintendent of Documents	100	
By Section of Foreign Markets	200	
By other divisions	44	
By legations in Washington	31	
By newspaper list	4,508	
By State agents and appointees	8,000	
By county agents	3,500	
By Bureau of Animal Industry list	1,000	
By Dairy Division list	2,000	
By Section of Foreign Markets list	1,500	
By miscellaneous	1,050	
		23,133
Balance		26,867

Agricultural Products Imported and Exported by the United States in the Years Ended June 30, 18[illegible] [illegible] 1896, inclusive. Pp. 8. (Circular No. 11.)

To delivery		10,000
By Secretary's re[illegible]	[illegible]00	
By other division[illegible]	[illegible]8	
By Bureau of Animal [illegible]	[illegible]00	
By legations in Washi[illegible]	30	
By Superintende[illegible]	[illegible]00	
By newspap[illegible]	[illegible]00	
By Library [illegible]	183	
By Senators a[illegible]	444	
By county correspondents	2,300	
By Hon. Jo[illegible] Robinson, [illegible]	100	
By Section [illegible]	[illegible]00	
By miscella[illegible]	3,995	
		10,000

Sources of the Principal Agricultural Imports of the United States during the Five Years ended June 30, 1896. Pp. 24. (Circular No. 12.)

To delivery		10,000
By Secretary's reserve	200	
By Section of Foreign Markets	200	
By Superintendent of Documents	100	
By other divisions	28	
By legations in Washington	30	
By Section of Foreign Markets list	4,740	
By Senators and Representatives	444	
By Experiment Stations list	125	
By newspaper list	575	
By Senators and Representatives	450	
By county correspondents	2,300	
By Hon. J. M. Robinson, M. C	100	
By miscellaneous	46	
		9,338
Balance		662

Distribution of the Principal Agricultural Exports of the United States during the Five years ended June 30, 1896. Pp. 24. (Circular No. 13.)

To delivery		10,400
By Secretary's reserve	200	
By Section of Foreign Markets	200	
By other divisions	44	
By legations in Washington	30	
By Section of Foreign Markets	1,000	
By newspaper list	575	
By Section of Foreign Markets list	3,182	
By Senators and Representatives	450	
By county correspondents	2,300	
By Library list	198	
By Hon. J. M. Robinson	100	
By miscellaneous	150	
		8,429
Balance		1,971

Hamburg as a Market for American Products. Pp. 10. (Circular No. 14.)

To delivery		10,000
By Secretary's reserve	200	
By Section of Foreign Markets	200	
By other divisions	42	
By legations in Washington	34	
By Senators and Representatives	450	
By newspaper list	580	
By Section of Foreign Markets list	2,300	
By Library list	187	
By Experiment Stations list	124	
By miscellaneous	150	
		4,267
Balance		5,733

Exports of Cotton from Egypt. By Frank H. Hitchcock, Chief of the Section of Foreign Markets. Pp. 7. (Circular No. 15.)

To delivery		5,000
By newspaper list	593	
By Section of Foreign Markets list	1,980	
By other divisions	48	
By Bureau of Animal Industry	978	
By Library list	178	
By Experiment Stations list	124	
By miscellaneous	100	
		4,001
Balance		999

Our Trade with Cuba from 1887 to 1897. By Frank H. Hitchcock, Chief of the Section of Foreign Markets. Pp. 30. (Circular No. 16.)

To delivery		10,000
By Secretary's reserve	200	
By Section of Foreign Markets	200	
By legations in Washington	30	
By other divisions	31	
By Congressmen	447	
By newspaper list	700	
By Division of Statistics list	2,314	
By Section of Foreign Markets list	2,500	
By Senator W. A. Harris	200	
By Hon. J. M. Robinson, M. C	500	
By Experiment Stations list	509	
By miscellaneous	16	
		7,647
Balance		2,353

DIVISION OF FORESTRY.

Report of the Chief of the Division of Forestry. Pp. 83–88, Message and Documents, Department of Agriculture, 1896.

To delivery		250
By Division of Forestry	100	
By miscellaneous	15	
		115
Balance		135

The Timber Pines of the Southern United States. By Charles Mohr, Ph. D. Together with a Discussion of the Structure of their Wood. By Filibert Roth. Prepared under the direction of B. E. Fernow, Chief of the Division of Forestry. Pp. 160, pls. 27, figs. 18. (Bulletin No. 13.)

To delivery		1,000
By Superintendent of Documents	100	
By Division of Forestry	250	
By other divisions	50	
By legations in Washington	30	
By Secretary's reserve	200	
By Division of Forestry list	200	
By Library list	125	
By Secretary's Office	13	
By miscellaneous	32	
		1,000

Nomenclature of the Arborescent Flora of the United States. By George B. Sudworth, Dendrologist of the Division of Forestry. Pp. viii, 419. (Bulletin No. 14.)

To delivery		1,000
By Secretary's reserve	150	
By Division of Forestry	200	
By Superintendent of Documents	50	
By Experiment Stations list	125	
By Library list	183	
By miscellaneous	289	
		997
Balance		3

Summary of Mechanical Tests on Thirty-two Species of American Woods. By B. E. Fernow, Chief of the Division of Forestry. Pp. 12, diag. 2. Quarto. (Circular No. 15.)

To delivery		5,000
By Secretary's reserve	200	
By Division of Forestry	200	
By other divisions	19	
By legations in Washington	34	

Summary of Mechanical Tests, etc.—Continued.

By Experiment Stations list	125	
By Library list	198	
By Division of Forestry	300	
By miscellaneous	100	
		1,176
Balance		3,824

DIVISION OF PUBLICATIONS.

Report of the Chief of the Division of Publications. Pp. 29–70, Message and Documents, Department of Agriculture, 1896.

To delivery		2,000
By Division of Publications	150	
By newspaper list	559	
By miscellaneous	6	
		715
Balance		1,285

DIVISION OF POMOLOGY.

Report of the Pomologist. Pp. 109–114, Message and Documents, Department of Agriculture, 1896.

To delivery		500
By Division of Pomology	200	
By miscellaneous	5	
		205
Balance		295

Report of the Pomologist for 1895. By Samuel B. Heiges. Pp. 64, pls. 6.

To delivery		15,000
By other divisions	26	
By Division of Pomology	200	
By Superintendent of Documents	100	
By legations in Washington	34	
By Secretary's reserve	200	
By Experiment Stations list	780	
By newspaper list	593	
By Library list	187	
By Division of Pomology list	11,908	
By Pomologist	200	
By miscellaneous	132	
		14,360
Balance		640

Nut Culture in the United States, Embracing Native and Introduced Species. Pp. 144, pls. 16, figs. 2. (Special Report.) Reprint.

To delivery		1,010
By Secretary's reserve	200	
By Superintendent of Documents	200	
By Division of Pomology list	517	
By miscellaneous	21	
		938
Balance		72

Fig Culture: Edible Figs: Their Culture and Curing. By Gustav Eisen, Curator in Biology, California Academy of Sciences, San Francisco, Cal. Fig Culture in the Gulf States. By Frank S. Earle, Horticulturist, Alabama Experiment Station, Auburn, Ala. Pp. 32. (Bulletin No. 5.)

To delivery		4,000
By Secretary's reserve	200	
By Division of Pomology	200	
By Superintendent of Documents	100	

Fig Culture, etc.—Continued.

By legations in Washington	34	
By other divisions	21	
By newspaper list	580	
By Library list	187	
By Division of Pomology list	2,166	
By Experiment Stations list	249	
By miscellaneous	49	
		3,796
Balance		204

OFFICE OF ROAD INQUIRY.

State Laws Relating to the Management of Roads, Enacted in 1894–95. Compiled by Roy Stone, Special Agent and Engineer. Pp. 86. (Bulletin No. 18.) Reprint.

To delivery		5,000
By Office of Road Inquiry	100	
By miscellaneous	25	
		125
Balance		4,875

State Laws Relating to the Management of Roads. Enacted in 1894–95. Compiled by Roy Stone, Special Agent and Engineer. Pp. v, 87–124. (Bulletin No. 18, Supplement.) Reprint.

To delivery		5,000
By Office of Road Inquiry	100	
By miscellaneous	6	
		106
Balance		4,894

Progress of Road Construction in the United States. Pp. 48. (Bulletin No. 19.)

To delivery		5,000
By Secretary's reserve	200	
By Office of Road Inquiry	200	
By Superintendent of Documents	100	
By legations in Washington	32	
By other divisions	14	
By Office of Road Inquiry list	1,101	
By newspaper list	575	
By Library list	189	
By Office of Road Inquiry	200	
By miscellaneous	510	
		3,121
Balance		1,879

Traction Tests. By Samuel T. Neely, Assistant Engineer, Office of Road Inquiry. Pp. 22, pls. 2, figs. 7. (Bulletin No. 20.)

To delivery		5,000
By Superintendent of Documents	100	
By Office of Road Inquiry	200	
By other divisions	44	
By Secretary's reserve	200	
By Library list	300	
By miscellaneous	339	
		1,183
Balance		3,817

Brick Paving for Country Roads. Pp. 7, figs. 6. (Circular No. 25.)

To delivery		10,000
By Secretary's reserve	200	
By Office of Road Inquiry	200	
By Superintendent of Documents	100	

Brick Paving for Country Roads—Continued.

By legations in Washington	32	
By other divisions	44	
By Office of Road Inquiry	200	
By Office of Road Inquiry list	1,101	
By Library list	189	
		2,066
Balance		7,134

Cost of Hauling Farm Products to Market or to Shipping Points in European Countries. Pp. 12. (Circular No. 27.)

To delivery		10,087
By Office of Road Inquiry	200	
By newspaper list	593	
By Library list	187	
By Experiment Stations list	124	
By Wallace Sherwood	30	
By miscellaneous	150	
		1,284
Balance		8,803

Addresses on Road Improvement in Maine, New York, North Carolina, and Illinois. By Roy Stone, special agent and engineer. Pp. 26. (Circular No. 28.)

To delivery		20,000
By Secretary's reserve	200	
By Office of Road Inquiry	400	
By legations in Washington	32	
By Office of Road Inquiry	3,775	
By Congressmen	444	
By Library list	187	
By E. D. White, Oregon	50	
By E. C. Fay, New York	25	
By Hon. J. M. Robinson, M. C	200	
By miscellaneous	200	
		5,513
Balance		14,487

The Forces which Operate to Destroy Roads, with Notes on Road Stones and Problems Therewith Connected. By C. L. Whittle. Pp. 14, pls. 4. (Circular No. 29.)

To delivery		5,000
By Secretary's reserve	200	
By other divisions	48	
By Office of Road Inquiry	200	
By legations in Washington	35	
By C. L. Whittle	200	
By Library list	178	
By Office of Road Inquiry list	200	
By newspaper list	609	
By Experiment Stations list	124	
By miscellaneous	350	
		2,144
Balance		2,856

SEED DIVISION.

Report of the Chief of the Seed Division. Pp. 151-154, Message and Documents, Department of Agriculture, 1896.

To delivery		100
By Seed Division	50	
By miscellaneous	4	
		54
Balance		46

DIVISION OF STATISTICS.

Report of the Statistician. Pp. 115–122, Message and Documents, Department of Agriculture, 1896.

To delivery		3,000
By Division of Statistics	2,800	
By miscellaneous	6	
		2,806
Balance		194

Title-page and Index of Crop Reports Nos. 134–144.

To delivery		1,000
By Division of Statistics	150	
By Division of Statistics list	742	
By Experiment Stations list	108	
		1,000

Crop Report for September, 1896. No. 141. Pp. 7.

To delivery		172,500
By Secretary's reserve	200	
By other divisions	44	
By newspaper list	495	
By Division of Statistics list	10,639	
By Library list	300	
By miscellaneous	81	
By divisional lists	160,000	
		171,759
Balance		741

Crop Report for October, 1896. No. 142. Pp. 7.

To delivery		175,000
By Secretary's reserve	200	
By other divisions	44	
By Division of Statistics	200	
By legations in Washington	31	
By Superintendent of Documents	100	
By newspaper list	536	
By Division of Statistics list	108,999	
By Library list	300	
By Weather Bureau	42	
By miscellaneous	117	
		110,567
Balance		64,431

Crop Report for November, 1896. No. 143. Pp. 4.

To delivery		186,000
By Secretary's reserve	200	
By Superintendent of Documents	100	
By other divisions	44	
By legations in Washington	31	
By newspaper list	510	
By Division of Statistics list	1,367	
By Division of Statistics	100	
By miscellaneous	17	
By divisional lists	160,000	
		162,369
Balance		22,631

Crop Report for December, 1896. No. 144. Pp. 16.

To delivery		180,394
By Division of Statistics	100	
By Library list	189	

Crop Report for December, 1896—Continued.

By Experiment Stations list	125	
By miscellaneous	8,849	
By divisional lists	160,000	
		169,263
Balance		11,131

Crop Report for January and February, 1897. No. 145. Pp. 7.

To delivery		186,000
By Secretary's reserve	200	
By Superintendent of Documents	100	
By legations in Washington	35	
By Division of Statistics	50,000	
By Library list	198	
By Hon. J. M. Robinson, M. C	100	
By Experiment Stations list	125	
By miscellaneous	34	
By divisional lists	130,000	
		180,792
Balance		5,208

Crop Report for March, 1897. No. 146. Pp. 4.

To delivery		175,000
By Secretary's reserve	200	
By other divisions	40	
By Experiment Stations list	125	
By Library list	198	
By Section of Foreign Markets	25	
By Division of Statistics	100	
By Hon. J. M. Robinson, M. C	100	
By divisional lists	160,000	
		160,805
Balance		14,195

Crop Report for April, 1897. No. 147. Pp. 8.

To delivery		210,690
By Senators and Representatives	444	
By Division of Publications	12	
By Division of Statistics list	500	
By county correspondents	10,357	
By Hon. W. L. Stark, M. C	100	
By Section of Foreign Markets	25	
By Library list	187	
By Hon. J. M. Robinson, M. C	200	
By Experiment Stations list	124	
By miscellaneous	125	
By divisional lists	175,000	
		187,074
Balance		23,616

Crop Report for May, 1897. No. 148. Pp. 4.

To delivery		202,000
By Secretary's reserve	200	
By Division of Statistics	700	
By legations in Washington	35	
By other divisions	28	
By newspaper list	593	
By Senators and Representatives	444	
By Library list	278	
By Experiment Stations list	124	
By miscellaneous	50	
By divisional lists	190,000	
		192,452
Balance		9,548

Crop Report for June, 1897. No. 149. Pp. 4.

To delivery		190,200
By Secretary's reserve	200	
By Division of Statistics	200	
By legations in Washington	35	
By other divisions	29	
By newspaper list	619	
By divisional lists	175,000	
		176,083
Balance		14,117

Freight Charges for Ocean Transportation of the Products of Agriculture. October 1, 1895, to October 1, 1896. Pp. 53. (Miscellaneous series. Bulletin No. 12.)

To delivery		5,000
By Secretary's reserve	200	
By Division of Statistics	300	
By Superintendent of Documents	100	
By other divisions	28	
By legations in Washington	30	
By Library list	189	
By Experiment Stations list	125	
By miscellaneous	60	
		1,032
Balance		3,968

The Farmers' Interest in Finance. By Henry Farquhar, Assistant Statistician. Pp. 15, figs. 2. (Circular No. 3.)

To delivery		20,000
By Division of Statistics	100	
By newspaper list	559	
By Secretary Morton	100	
By Library list	182	
By miscellaneous	14,980	
		15,921
Balance		4,980

The Cotton Crop of 1895. Pp. 15. (Circular No. 4.)

To delivery		17,000
By Secretary's reserve	200	
By Division of Statistics	200	
By other divisions	42	
By legations in Washington	35	
By Superintendent of Documents	100	
By newspaper list	560	
By Library list	183	
By Division of Statistics list	14,000	
By Experiment Stations list	125	
By miscellaneous	1,356	
		15,801
Balance		1,199

Local Taxation as Affecting Farms. Pp. 16. (Circular No. 5.)

To delivery		82,000
By Secretary's reserve	200	
By Division of Statistics	200	
By Superintendent of Documents	100	
By other divisions	40	
By legations in Washington	34	
By newspaper list	575	
By Library list	198	
By miscellaneous	21,195	
		22,542
Balance		59,448

Cereal Crops of 1896. Pp. 12. (Circular No. 6.)

To delivery		30,000
By Secretary's reserve	200	
By legations in Washington	35	
By Senators and Representatives	444	
By Division of Statistics	500	
By county correspondents	10,357	
By Section of Foreign Markets	25	
By Library list	187	
By Hon. J. M. Robinson, M. C	100	
By Experiment Stations list	124	
By miscellaneous	106	
		12,078
Balance		17,922

The Cotton Crop of 1896. Pp. 4. (Circular No. 7.)

To delivery		14,000
By Secretary's reserve	200	
By other divisions	42	
By Division of Statistics	300	
By legations in Washington	35	
By Library list	187	
By Division of Statistics	1,200	
By miscellaneous	112	
		2,076
Balance		11,924

DIVISION OF VEGETABLE PHYSIOLOGY AND PATHOLOGY.

Report of the Chief of the Division of Vegetable Physiology and Pathology. Pp. 15–22, Message and Documents, Department of Agriculture, 1896.

To delivery		250
By Division of Vegetable Physiology and Pathology	100	
By miscellaneous	1	
		101
Balance		149

A Bacterial Disease of the Tomato, Eggplant, and Irish Potato (*Bacillus solanacearum* n. sp). By Erwin F. Smith, Assistant Pathologist. Pp. 22, pls. 3. (Bulletin No. 12.)

To delivery		1,450
By Secretary's reserve	200	
By Superintendent of Documents	100	
By Division of Vegetable Physiology and Pathology	200	
By legations in Washington	35	
By other divisions	20	
By Library list	182	
By miscellaneous	672	
		1,419
Balance		31

Sooty Mold of the Orange and Its Treatment. By Herbert J. Webber, Assistant in Division of Vegetable Physiology and Pathology. Pp. 44, pls. 5. (Bulletin No. 13.)

To delivery		1,600
By Secretary's reserve	200	
By Division of Vegetable Physiology and Pathology	200	
By legations in Washington	34	
By other divisions	13	
By Superintendent of Documents	100	
By miscellaneous	2	
		549
Balance		1,051

WEATHER BUREAU.

The publications of the Weather Bureau are not distributed by the Division of Publications. The following statement is furnished by an official of the Bureau specially charged with such work:

Mr. GEO. WM. HILL,
Chief of Division of Publications,
U. S. Department of Agriculture, Washington, D. C.

SIR: In compliance with instructions in a letter from the honorable the Secretary of Agriculture, dated March 29, 1897, I have the honor to submit herewith a statement showing in detail the receipt and distribution of Weather Bureau publications during the quarter ended June 30, 1897.

Very respectfully,

C. J. JONES,
In Charge of Distribution of Weather Bureau Publications.

Publications received during the quarter ending June 30, 1897.

Title of publication.	Number of copies.
Monthly Weather Review, February, 1897	3,800
Monthly Weather Review, March, 1897	3,800
Monthly Weather Review, April, 1897	4,000
Instructions to Voluntary Observers, 1897	5,000
Washington Daily Weather Maps	172,730
Climate and Crop Bulletins	54,783
Climate and Crop Bulletins, 1896, bound	7
Weather Bureau Bulletins, 11 to 20, inclusive, bound	20
Daily River Stages, Part V, bound	149
Charts of River and Flood Service, by Park Morrill	60

Publications distributed during the quarter ending June 30, 1897.

Title of publication.	Number of copies.
Annual Report of the Chief Signal Officer, Part 2, 1897	2
Annual Report of the Chief Signal Officer, Part 2, 1889	1
Annual Report of the Chief of Weather Bureau, 1891-92 (data vol.)	7
Annual Report of the Chief of Weather Bureau, 1893 (data vol.)	19
Annual Report of the Chief of Weather Bureau, 1894 (data vol.)	15
Annual Report of the Chief of Weather Bureau, 1895-96 (data vol.)	45
Special Report of Chief of Weather Bureau, 1891	6
Pamphlet Report of Chief of Weather Bureau, 1892	6
Pamphlet Report of Chief of Weather Bureau, 1893	6
Pamphlet Report of Chief of Weather Bureau, 1895	7
Pamphlet Report of Chief of Weather Bureau, 1896	18
Extracts, Annual Report of Chief of Weather Bureau, 1891-92	154
Extracts, Annual Report of Chief of Weather Bureau, 1893	11
Extracts, Annual Report of Chief of Weather Bureau, 1894	15
Extracts, Annual Report of Chief of Weather Bureau, 1895-96	420
Weather Bureau Bulletin "A"	2
Weather Bureau Bulletin "B"	3
Weather Bureau Bulletin "C"	17
Weather Bureau Bulletin No. 3	1
Weather Bureau Bulletin No. 5	1
Weather Bureau Bulletin No. 9	7
Weather Bureau Bulletin No. 10	10
Weather Bureau Bulletin No. 11, Part III	12
Weather Bureau Bulletin No. 12	6
Weather Bureau Bulletin No. 13	23
Weather Bureau Bulletin No. 14	5
Weather Bureau Bulletin No. 15 (3d edition)	143
Weather Bureau Bulletin No. 16	11
Weather Bureau Bulletin No. 18	11
Weather Bureau Bulletin No. 19	10
Weather Bureau Bulletin No. 20	73
Climate and Health	36
Description of Cloud Forms Charts	671
Departures from the Normal Temperature and Rainfall, with Crop Yields in Nebraska	3
A Weather Bureau Kite, pamphlet	123
Kite Experiment at the Weather Bureau	90
Experiment Bulletin No. 10	3

Publications distributed during the quarter ending June 30, 1897—Continued.

Title of publication.	Number of copies.
Instructions to Voluntary Observers, 1892	77
Instructions to Voluntary Observers, 1897	3,923
Index to Monthly Weather Reviews and Annual Reports to 1889	2
Injury from Frost and Methods of Protection	9
Monthly Weather Reviews, bound	13
Monthly Weather Review for February, 1897	3,613
Monthly Weather Review for March, 1897	3,610
Monthly Weather Review for April, 1897	3,817
Monthly Weather Reviews of different months and years, bound in paper	4,150
Report of Climate of Colorado and Utah	1
Report of Climate of Oregon and Washington	1
Report of the Point Barrow Expedition, by Lieutenant Ray	1
Pamphlet Report of the Secretary of Agriculture, 1895	2
Pamphlet Report of the Secretary of Agriculture, 1896	4
Statistics of State Weather Services	3
Studies of Weather Types and Storms, Parts I and II	9
Professional Papers of the Signal Service	4
What Meteorology is Doing for the Farmer	3
Some Climatic Features of the Arid Regions	29
Certain Climatic Features of the Two Dakotas	3
Flood Charts	53
Atmospheric Circulation in Tropical Cyclones, as shown by Movements of Clouds	6
Weather Maps, Storms and Weather Forecasts	2
Excessive Precipitation in the United States (extract from M. W. R.)	175
Charts of River and Flood Service, by Park Morrill	60
Weather Bureau Bulletins, bound, Nos. 11 to 20, inclusive	17
Daily River Stages, Part V, bound	84
Climate and Crop Bulletins, bound, 1896	6
Climate and Crop Bulletins, weekly	53,483
Washington Daily Weather Maps, daily	170,455

REMARKS.

The above-mentioned publications were distributed to colleges, libraries, voluntary observers, Weather Bureau stations, foreign exchanges, and to persons making application for them from time to time.

WORK DONE IN BRANCH PRINTING OFFICE.

The following statement shows the total number of envelopes, letter heads, cards, circulars, blanks, etc., printed under the 1,355 requisitions issued on the branch printing office from July 1, 1896, to June 30, 1897:

Envelopes	804,500
Letter heads	632,500
Cards	5,760,500
Circulars	2,302,500
Blanks	4,053,000
Total	13,553,000

REPORT OF THE CHIEF OF THE DIVISION OF ACCOUNTS AND DISBURSEMENTS.

U. S. DEPARTMENT OF AGRICULTURE,
DIVISION OF ACCOUNTS AND DISBURSEMENTS,
Washington, D. C., July 20, 1897.

SIR: I have the honor to submit herewith a report of the operations of this division for the fiscal year ending June 30, 1897.

Very respectfully,

F. L. EVANS, *Chief.*

Hon. JAMES WILSON, *Secretary.*

WORK OF THE YEAR.

PAYMENTS AND EXPENDITURES.

Including the sum of $720,000 for agricultural experiment stations, Congress appropriated to the United States Department of Agriculture for the fiscal year ending June 30, 1897, $3,168,532.

While the appropriation for agricultural experiment stations is included in the act making appropriations for the Department of Agriculture, the money is paid quarterly directly to the 48 experiment stations, as provided by the act approved March 2, 1887. The expenditures from this fund are, therefore, not considered in this report nor in the monthly financial statements issued from this office.

Of the amount appropriated for the fiscal year 1897, $2,146,044.23 was disbursed prior to July 1, 1897. There remained on that date unpaid bills aggregating $184,000. When these shall have been paid the total expenditures from the appropriations for the year 1897 will be, in round numbers, $2,330,000, leaving a final balance to return to the Treasury of about $118,000. The total amount paid out during the year was $2,306,365.36, including $1,488.10 for supplemental accounts of 1895 and $159,836.57 for those of 1896.

Of the appropriations for 1897 there remained at the close of business on March 5, 1897, $1,120,493.44. Against this unexpended balance there were actual liabilities amounting to about $160,000, leaving an unencumbered or available balance on that date of $960,493.44. These liabilities included the purchase of supplies for the Weather Bureau stations practically to the end of the fiscal year, it being customary to purchase such supplies semiannually in advance.

The expenditures and balances on account of the several funds, as shown on March 5, 1897, are given in detail in the following table:

Objects.	Appropriations, 1897.	Total.	Amount of warrants.	Amount disbursed.	Amount unexpended.
Salaries, officers and clerks	$283,860	$313,860.00	$191,000.00	$171,223.67	$112,636.33
Messengers, laborers, and mechanics	20,000			12,780.83	7,219.17
Additional assistants in laboratory	10,000			5,135.90	4,864.10
Furniture, cases, and repairs, Department of Agriculture		12,000.00	5,200.00	5,431.35	6,568.65
Library, Department of Agriculture		7,000.00	3,200.00	3,063.73	3,936.27
Museum, Department of Agriculture		3,000.00	2,100.00	1,992.90	1,007.10
Postage, Department of Agriculture		3,000.00	1,280.00	1,380.00	1,620.00
Contingent expenses, Department of Agriculture		25,000.00	11,000.00	11,464.33	13,535.67
Animal quarantine stations		12,000.00	4,000.00	3,729.04	8,270.96
Collecting agricultural statistics	100,000	110,000.00	46,500.00	43,408.81	56,591.19
Investigating foreign demands for United States agricultural products	10,000			3,300.03	6,699.97
Botanical investigations and experiments		15,000.00	8,272.45	8,125.34	6,874.66
Entomological investigations		20,000.00	10,987.00	10,930.23	9,069.77
Vegetable pathological investigations	19,340	20,000.00	12,600.00	11,731.63	7,608.37
Rent of building	660			440.00	220.00
Biological investigations		17,500.00	10,619.80	10,588.06	6,911.94
Pomological investigations		6,000.00	3,200.00	2,945.52	3,054.48
Laboratory, Department of Agriculture	4,000	12,400.00	6,300.00	942.43	3,057.57
Rent of building	900			525.00	375.00
Adulteration of food	7,500			4,600.88	2,899.12
Forestry investigations		20,000.00	6,702.75	6,695.17	13,304.83
Experimental gardens and grounds, Department of Agriculture		20,000.00	11,900.00	11,693.85	8,306.15
Soil investigations	9,340	10,000.00	5,700.00	5,094.23	4,245.77
Rent of building	660			440.00	220.00
Grass and forage plant investigations		10,000.00	6,955.15	6,463.17	3,536.83
Fiber investigations		5,000.00	3,000.00	2,853.05	2,146.95
Agricultural experiment stations	*750,000	30,000.00	18,300.00	17,987.57	12,012.43
Nutrition investigations		15,000.00	6,000.00	7,044.39	7,955.61
Public road inquiries		8,000.00	5,300.00	5,244.32	2,755.68
Publications, Department of Agriculture:					
Farmers' Bulletins	50,000	70,000.00	26,700.00	16,886.08	33,113.92
Artists, draftsmen, engravers, etc	15,000			8,342.39	6,657.61
Distribution of documents	5,000			1,463.98	3,536.02
Purchase and distribution of valuable seeds		150,000.00	53,300.00	55,833.01	94,166.99
Salaries and expenses, Bureau of Animal Industry	648,800	650,000.00	394,174.55	361,852.84	286,947.16
Rent of building	1,200			700.00	500.00
Total		1,564,760.00		822,333.73	742,426.27
WEATHER BUREAU.					
Salaries, Weather Bureau	149,740	150,540.00	97,000.00	95,111.68	54,628.32
Temporary employment of messengers and laborers	800			239.00	561.00
Fuel, lights, and repairs, Weather Bureau		8,000.00	4,700.00	4,601.73	3,398.27
Contingent expenses, Weather Bureau		8,000.00	4,100.00	4,003.43	3,996.57
General expenses, salaries	352,195	717,232.00	402,325.58	230,541.40	121,653.60
General expenses, miscellaneous	365,037			171,207.59	193,829.41
Total, Weather Bureau		883,772.00		505,704.83	378,067.17
Grand total		2,448,532.00		1,328,038.56	1,120,493.44

* Of this amount, $720,000 is paid directly from the Treasury Department.

The statement of the appropriations for 1897, the amounts disbursed during the year, and the unexpended balances June 30, 1897, is as follows:

Objects.	Appropriations, 1897.	Total.	Amount of warrants.	Amount disbursed.	Amount unexpended.
Salaries, officers and clerks	$283,860	$313,860.00	$292,500.00	$262,648.39	$21,211.61
Messengers, laborers, and mechanics	20,000			19,855.36	144.64
Additional assistants in laboratory	10,000			8,288.20	1,711.80
Furniture, cases, and repairs, Department of Agriculture		12,000.00	9,000.00	8,782.98	3,217.02
Library, Department of Agriculture		7,000.00	5,200.00	4,685.44	2,314.56
Museum, Department of Agriculture		3,000.00	2,900.00	2,889.60	110.40
Postage, Department of Agriculture		3,000.00	1,730.00	1,730.00	1,270.00
Contingent expenses, Department of Agriculture		25,000.00	19,000.00	17,875.60	7,124.40
Animal quarantine stations		12,000.00	6,000.00	5,657.91	6,342.09
Collecting agricultural statistics	100,000	110,000.00	83,500.00	77,113.63	22,886.37
Investigating foreign demands for United States agricultural products	10,000			4,308.33	5,691.67
Botanical investigations and experiments		15,000.00	12,972.45	12,618.33	2,381.67
Entomological investigations		20,000.00	17,728.50	17,775.16	2,224.84
Vegetable pathological investigations	19,340	20,000.00	18,800.00	17,413.75	1,926.25
Rent of building	660			605.00	55.00
Biological investigations		17,500.00	16,819.80	16,305.32	1,194.68
Pomological investigations		6,000.00	4,803.47	4,784.45	1,215.55
Laboratory, Department of Agriculture	4,000	12,400.00	10,500.00	2,559.48	1,440.52
Rent of building	900			825.00	75.00
Adulteration of food	7,500			6,466.76	1,033.24
Forestry investigations		20,000.00	12,402.75	12,131.34	7,868.66
Experimental gardens and grounds, Department of Agriculture		20,000.00	18,700.00	18,977.32	1,022.68
Soil investigations	9,340	10,000.00	10,000.00	8,779.50	560.50
Rent of building	660			605.00	55.00
Grass and forage plant investigations		10,000.00	9,155.15	8,635.27	1,364.73
Fiber investigations		5,000.00	4,500.00	4,136.00	864.00
Agricultural Experiment Stations	*750,000	30,000.00	29,600.00	28,132.08	1,867.92
Nutrition investigations		15,000.00	12,100.00	11,373.22	3,626.78
Public-road inquiries		8,000.00	8,000.00	7,633.92	366.08
Publications, Department of Agriculture:					
Farmers' bulletins	50,000	70,000.00	60,400.00	41,247.27	8,752.73
Artists, draftsmen, engravers, etc	15,000			14,062.38	937.62
Distribution of documents	5,000			4,694.57	305.43
Purchase and distribution of valuable seeds		150,000.00	133,300.00	132,968.07	17,031.93
Salaries and expenses, Bureau of Animal Industry	648,800	650,000.00	579,264.61	571,774.46	77,025.54
Rent of building	1,200			1,100.00	100.00
Total		1,564,760.00		1,359,439.09	205,320.91
WEATHER BUREAU.					
Salaries, Weather Bureau	149,740	150,540.00	145,700.00	144,627.95	5,112.05
Temporary employment of messengers and laborers	800			415.65	384.35
Fuel, lights, and repairs, Weather Bureau		8,000.00	7,600.00	7,204.94	795.06
Contingent expenses, Weather Bureau		8,000.00	7,400.00	6,904.16	1,095.84
General expenses, salaries	352,195	717,232.00	631,292.10	349,875.73	2,319.27
General expenses, miscellaneous	365,037			277,576.71	87,460.29
Total, Weather Bureau		883,772.00		786,605.14	97,166.86
Grand total		2,448,532.00		2,146,044.23	302,487.77

*Of this amount, $720,000 is paid directly from the Treasury Department.

The following is a comparative statement showing the appropriations for 1897, the estimates for 1898, the amounts provided by the House bill, and the amounts recommended by the Senate Committee on Appropriations for 1898. The total amount appropriated for 1898 was $14,370 more than that for 1897:

Object.	Appropriations, 1897.	Estimates, 1898.	House bill, 1898.	Senate committee, 1898.
For salaries	$313,860	$344,070	$316,100	$319,300
Miscellaneous, namely:				
Collecting agricultural statistics	110,000	110,000	110,000	110,000
Botanical investigations and experiments	15,000	20,000	15,000	17,500
Entomological investigations	20,000	20,000	20,000	20,000
Vegetable pathological investigations	20,000	20,000	20,000	20,000
Biological investigations	17,500	22,500	17,500	20,000
Pomological investigations	6,000	8,000	6,000	8,000
Laboratory, division of chemistry	12,400	12,400	12,400	12,400
Forestry investigations	20,000	20,000	20,000	20,000
Experimental garden and grounds	20,000	25,000	25,000	25,000
Soil investigations	10,000	12,000	10,000	10,000
Grass and forage plant investigations	10,000	10,000	10,000	10,000
Agricultural experiment stations	750,000	35,000	750,000	755,000
Gauging streams, etc., by the Geological Survey	4,500			
Nutrition investigations	15,000	15,000	15,000	15,000
Fiber investigations	5,000	5,000	5,000	5,000
Public road inquiries	8,000	8,000	8,000	8,000
Library of the Department	7,000	7,000	5,000	7,000
Bulletins and reports	70,000	80,000	65,000	70,000
Copies of Special Report on Diseases of the Horse	42,500			
Copies of Special Report on Diseases of Cattle, and Cattle Feeding	40,000			
Animal quarantine stations	12,000	12,000	12,000	12,000
Museum	3,000	3,000	3,000	3,000
Postage	3,000	3,000	3,000	3,000
Furniture, cases, and repairs	12,000	10,000	9,000	9,000
Contingent expenses	25,000	25,000	20,000	25,000
Purchase and distribution of valuable seeds	150,000		120,000	150,000
Bureau of Animal Industry	650,000	675,000	675,000	675,000
Total	2,057,900	1,157,900	1,955,900	2,009,900
Weather Bureau, namely:				
Salaries, office of Chief of Bureau	150,540	150,610	150,540	150,540
Fuel, lights, and repairs	8,000	8,000	8,000	8,000
Contingent expenses	8,000	8,000	8,000	8,000
General expenses	717,232	717,162	717,162	717,162
Total, Weather Bureau	883,772	883,772	883,702	883,702
Total, Department of Agriculture	3,255,532	2,385,742	3,155,702	3,212,902

The appropriations of the Department for 1897, arranged in three divisions, are shown below, with the amounts appropriated and disbursed on account of each, viz:

	Amount appropriated.	Amount disbursed.
Divisional	$914,760	$786,564.63
Bureau of Animal Industry	650,000	572,874.46
Weather Bureau	883,772	786,605.14
Total	2,448,532	2,146,044.23

ESTIMATES OF APPROPRIATIONS.

The estimates of appropriations for the year ending June 30, 1897, were prepared, as usual, in this office, based upon recommendations submitted by chiefs of bureaus and divisions of the Department, and

after approval by the honorable Secretary were transmitted to the United States Treasury, as required by law. A carefully prepared statement of all variations and new items, with full explanation thereof, was furnished to the Committees on Appropriations and Agriculture. Congress appropriated $77,160 more for 1898 than was estimated for by the Department. This difference is partly explained by the fact that no amount was included in the estimates for that year for the "Purchase and distribution of valuable seeds." Congress, however, appropriated for this purpose $130,000, requiring the Secretary of Agriculture to expend not less than the sum of $110,000 in the purchase of seeds, leaving but $20,000 for all other expenses in connection therewith.

The estimates provided for $24,790 more for statutory salaries than was subsequently appropriated; $1,000 more for "Furniture, cases, and repairs;" $5,000 more for "Botanical investigations and experiments;" $5,000 more for "Biological investigations;" $2,000 more for "Soil investigations;" and $15,000 more for "Publications." The estimates provided for a library division, with statutory salaries for six persons, amounting to $6,960. This provision was favorably considered by Congress, and the Library Division has been established. Seven thousand five hundred dollars of the increase recommended in statutory salaries for 1898 by the Secretary was intended to provide for an addition to the salaries of certain chiefs and assistant chiefs of divisions of $500 and $200, respectively, the recommendation being submitted in the interest of equity and in order to place chiefs of the Department of Agriculture upon an equality with scientific experts in other branches of the Government service and in universities and colleges.

All the bureaus and divisions of the Department have statutory salary rolls, except the Office of Agricultural Experiment Stations, the Divisions of Public Roads and of Fiber Investigations. Salaries of all persons engaged in these three offices are paid from the lump sums appropriated thereto, and are arbitrarily fixed by the head of the Department. The statutory rolls and the amounts appropriated for each appear in the following statement:

Office of the Secretary	$94,340
Division of Accounts	16,300
Division of Publications	8,300
Document and Folding Room	7,040
Division of Statistics	35,160
Division of Botany	8,800
Division of Entomology	9,500
Division of Biological Survey	10,060
Division of Pomology	6,500
Division of Vegetable Physiology and Pathology	6,500
Division of Chemistry	17,100
Division of Soils	5,300
Division of Agrostology	8,100
Division of Forestry	8,520
Experimental gardens and grounds	2,500
Museum	2,400
Bureau of Animal Industry	67,440
Total	313,860
Salaries, Weather Bureau	150,540
Grand total	464,400

UNEXPENDED BALANCES OF APPROPRIATIONS.

The unexpended balances of the appropriations for the year ending June 30, 1895, were carried to the surplus fund and covered into the Treasury on June 30, 1897, as provided by law. The balances of the appropriations for 1896 will be available for return to the Treasury on June 30, 1898, when there will remain slightly less than $490,000. The final balance for the year 1895, $485,884.62, is substantially the sum estimated in the report of this office for 1896, which provided in round numbers for $486,000.

PROCEEDS OF GOVERNMENT PROPERTY.

The following statement includes all sums of money received in this office during the year from the sale of Government property of every description, including card index of the agricultural experiment stations and certain Weather Bureau publications, and from seacoast telegraph line receipts, amounting to $6,230.87. These sums were deposited in the Treasury and carried to the proper funds, as required by law:

Condemned property	$1,884.87
Card index	127.25
Publications	104.28
United States seacoast telegraph line receipts	4,114.47
Total	6,230.87

WEATHER BUREAU TELEGRAPH SERVICE.

The amount paid for telegraph service by the Weather Bureau for the year 1897 was $151,000.

NUMBER OF ACCOUNTS PAID, REQUISITIONS AND AUTHORIZATIONS ISSUED, CHECKS DRAWN, ETC.

During the year 14,876 accounts were received, audited, and paid, including supplemental payments for 1895 and 1896, and bond-aided accounts settled at the Treasury, as follows: Divisional, 4,464, amounting to $830,720.71; Bureau of Animal Industry, 3,027, amounting to $625,133.58; Weather Bureau, 7,385, amounting to $850,511.07; total amount, $2,306,365.36. In settlement of these 23,532 checks were drawn in and issued from this office, largely on New York for the convenience of payees. With a view to expediting the settlement of claims and for the further accommodation of agents and others in the West doing business with the Department of Agriculture, this office has recently opened an account with the subtreasury at Chicago.

N[illegible] requisitions were drawn on the United States Treasury [illegible] aggregating $2,315,928.68 [illegible] the settlement of all claims [illegible] arising during [illegible] including cer- [illegible]

[illegible] year [illegible]

[illegible] other [illegible]

[illegible] regular con- [illegible]

The number of requests for passenger transportation issued to officers and agents of the Department traveling on official business was 1,294.

The number of requests drawn on the Quartermaster-General for transportation of Government property was 1,545.

MONTHLY CHECK STATEMENTS.

The monthly check statements rendered by the Treasury and subtreasury at Washington and New York have been carefully compared and verified in this division and so certified. During the year four checks were lost in the mails. In the case of a lost check it is provided that a duplicate may be issued after the expiration of six months, by the owner complying with certain regulations prescribed by the Treasury.

QUARTERLY SETTLEMENT OF ACCOUNTS.

The accounts of this Department are required to be rendered to the United States Treasury by the 10th day of the month following the end of the quarter. They have invariably been submitted in advance of that date, thus securing prompt consideration by the accounting officers. The accounts of the Department for the first three quarters of the year have been audited and certified as correct, while those for the fourth quarter are now in course of settlement.

STATEMENT TO CONGRESS OF ANNUAL EXPENDITURES.

A report in detail of the expenditures of all appropriations for the last preceding fiscal year, including the names of all persons employed and the sums paid to each, was prepared in this office and transmitted to Congress last fall, in compliance with the law. These annual reports of detailed expenditures of the Department are subsequently printed by order of Congress.

ANNUAL SUPPLIES.

The advertisement soliciting bids for annual supplies to be furnished this Department during the fiscal year 1897 was issued on April 6, 1896, and the bids received thereunder were opened on the 7th day of the ensuing month by the board of award appointed by the Secretary of Agriculture for the purpose. The board, after duly considering and tabulating all bids received, submitted its recommendations to the Secretary of Agriculture. These were approved by him and referred to the Treasury for final action, in compliance with the act amending section 3709 of the Revised Statutes. After the recommendations of this Department had been approved and returned by the reviewing board of the Treasury contracts were awarded by the Department of Agriculture at rates generally lower than those for the preceding year. These contracts were secured by a bond in each case in a sum determined by the amount of the award. All supplies used by this Department are, as far as practicable, secured by competitive bid, at the lowest obtainable prices combining economy and excellence of quality. Contracts for annual supplies for the year beginning July 1, 1897, have been entered into on terms and at prices fully as favorable as those of last year. The price of ice is 3 cents higher

per 100 pounds, but all items of fuel range lower than last year. Should the entire quantity of coal estimated for for the ensuing year be purchased, the difference between the price paid last year and that to be paid under the contract for the ensuing year will amount to over $800 in favor of the latter year.

In the report of this office for 1896 attention was invited to the delay, without any apparent advantage accruing to the Government, occasioned by the present plan of referring all bids to the Treasury for review and approval, under the act of January 27, 1894. This plan is clearly not in the interest of the Department, and in many cases works a hardship to the contractor. Contracts entered into at an earlier date than that which is possible under the present system would result in better prices to the Government on certain classes of supplies. If the Treasury Department were authorized to make contracts for the furnishing of fuel and ice to all the Executive Departments and their subordinate branches in the District of Columbia at uniform prices, a large annual saving would result to the Government, and the effect would be to correct the present tendency to combination on the part of dealers in those wares.

LEGAL PAPERS, AND RECOMMENDATION FOR THE APPOINTMENT OF A LAW CLERK.

Experience has shown that a great advantage is to be derived by having contracts, agreements, leases, authorizations, and similar papers confined to the fiscal year in which they are in effect. This has finally been accomplished and has resulted in a saving of labor, in greater accuracy, and in the avoidance of many annoying details. All leases are drawn to be renewable at the end of each fiscal year. In this connection attention is invited to the urgent and daily increasing demand for the services of a law clerk in the Department of Agriculture. The other Executive Departments are fully provided with legally trained assistants, to whom are referred all questions of a technical nature. Legal papers, such as contracts, leases, agreements, bonds, etc., are now prepared in this division and the legal correspondence of the Department conducted therefrom, adding greatly to the labor and responsibility of its officers. It is earnestly recommended, therefore, that a law clerk be provided and placed in charge of the legal business of the Department, who, in addition to being a graduate of a school of recognized standing, should be well informed on the general practice of law, on the construction of the Statutes, and be familiar with the decisions of the Comptroller and the several Auditors of the Treasury. Such a person may possibly be obtained from the eligible register of the Civil Service Commission.

APPROPRIATIONS TO PROVIDE FOR EXPERIMENT STATION CARRIED TO SURPLUS FUND.

The act making appropriations for this Department for the fiscal year ending June 30, 1891, provides the sum of $20,000, to "enable the Secretary of Agriculture to prepare such portions of the Arlington estate, not exceeding 80 acres in extent, as may be assigned to him by the Secretary of War, as an experimental station, and for expenses incurred in removing the present experimental station of the Bureau of Animal Industry to said estate." In view of section 5 of the act of June 20, 1874, chapter 328, this appropriation had been

regarded as coming within the term "permanent specific appropriations" of said act, and the account has accordingly been kept open on the books of this Department. The departmental construction is confirmed in a letter from the Attorney-General, dated May 16, 1893. A recent letter from the Comptroller of the Treasury, however, informs this office "that the entire amount of this appropriation, $20,000, no part of it having been used, was, on June 29, 1895, carried to the surplus fund by the Secretary of the Treasury." In consequence of this action the appropriation is no longer available for the purposes specified in the original act; and the account has been closed on the books of this Department, to make them correspond with the books of the Treasury.

BUILDINGS RENTED BY THE DEPARTMENT IN THE DISTRICT OF COLUMBIA.

The location, annual rental, and use of the various buildings under lease by this Department in the District of Columbia during the year 1897 are shown in the following statement:

No. 1362 B street SW., Bureau of Animal Industry laboratory	$1,200
No. 1364 B street SW., chemical laboratory	900
No. 212 Thirteenth street SW., offices and laboratories	660
No. 214 Thirteenth street SW., offices and laboratories	660
Bennings, D. C., Bureau of Animal Industry Veterinary Experiment Station	600
Total	4,020

STATIONS UNDER LEASE BY THE DEPARTMENT OUTSIDE OF THE DISTRICT OF COLUMBIA.

Below is a list of the Bureau of Animal Industry and Weather Bureau stations under lease by the Department of Agriculture, outside of the District of Columbia, for the fiscal year 1897.

BUREAU OF ANIMAL INDUSTRY.

The Bureau of Animal Industry stations, with location and annual or monthly rental, are as follows:

List of premises leased by Bureau of Animal Industry.

Place.	Location.	Rental per month.
Baltimore, Md	215 St. Paul street	a$125.00
Bethesda, Md		50.00
Boston, Mass	21 Doane street	40.00
Buffalo, N. Y	395 Ellicott street	25.00
Chicago, Ill	4193 Halsted street	225.00
Do	Exchange Building	15.00
Garfield, N. J		a1,200.00
Indianapolis, Ind	Stock Yards	10.00
Kansas City, Kans	7½ South James street	45.00
Kansas City, Mo	Live Stock Exchange Building	15.00
Littleton, Mass		a250.00
East St. Louis, Ill	St. Clair County	29.25
New York, N. Y	509 West Fifty-ninth street	14.00
Do	18 Broadway	a500.00
Norfolk, Va	70 Plume street	12.00
San Francisco, Cal	87 Flood Building	20.00
South Omaha, Nebr	Over Packers' National Bank	50.00
St. Joseph, Mo	Buchanan County	12.50
St. Denis, Md		a225.00

a Per annum.

WEATHER BUREAU.

[illegible] Weather Bureau stations, with location and amounts of annual rental, including various items, such as heat, [illegible] anit[illegible] [illegible]rooms, matches, etc., are as follows:

	Station.	Location.	Rent.	
			Amount.	Includes—
	Abilene, Tex	On South First street	*$424.45	Heat, cleaner, oil, matches, ink, mucilage, brooms, ice, and water.
	Albany, N. Y	In public building, corner Broadway and State street		
	Alpena, Mich	Corner Fletcher and Dock streets	*211.36	Heat, cleaner, light, oil, matches, ink, and mucilage.
	Amarillo, Tex	Corner Polk and Fifth streets	*200.00	Heat, cleaner, oil, matches, and ice.
	Astoria, Oreg	In Western Union Building, corner Eleventh and Commercial streets.	*180.00	Heat, cleaner, light, oil, matches, ink, mucilage, brooms, and ice.
	Atlanta, Ga	In public building, corner Marietta and Forsyth streets		
	Atlantic City, N. J	In Real Estate and Law Building, 1421 Atlantic avenue	*137.00	Heat and light.
	Augusta, Ga	In public building, corner Campbell and Greene streets		
	Baker City, Oreg	In Bloch Building, on Main street	*350.00	Heat, cleaner, light (oil), matches, ink, mucilage, brooms, ice, and soap.
	Baltimore, Md	Johns Hopkins University, 532 North Howard st		
	Binghamton, N. Y	In public building, corner Water and Henry streets		
	Birmingham, Ala	In Walker and Jordan Building, 2011 First avenue	60.00	
	Bismarck, N. Dak	In public building, corner Main and First streets		
	Block Island, R. I	In Weather Bureau building, on Main street	*259.97	Heat, cleaner, light, oil, matches, ink, mucilage, brooms, and ice.
	Boston, Mass	In public building, Post-Office Square		
	Buffalo, N. Y	In Guaranty Building, corner Pearl and Church streets	*504.76	Heat, cleaner, light, oil, matches, ink, mucilage, brooms, and ice.
	Cairo, Ill	In public building, corner Washington avenue and Fourteenth street.		
1	Canby, Fort, Wash	Weather Bureau building, summit of Cape Hancock		
9	Cape Henry, Va	In Weather Bureau building		
0	Cape May, N. J	In Ocean House, corner Decatur street and Beach avenue	*300.00	Heat, cleaner, and light.
1	Carson City, Nev	In public building, on Carson street		
22	Charleston, S. C	In public building, 200 East Bay street		
23	Charlotte, N. C	In public building, corner Trade and Mint streets		
24	Chattanooga, Tenn	In public building, corner Eleventh and A streets		
25	Cheyenne, Wyo	In Commercial Building, 216-218 West Sixteenth street	*367.61	Heat, cleaner, light, matches, ink, mucilage, brooms, ice, water, and soap.
26	Chicago, Ill	Auditorium Building, corner Wabash avenue and Congress street.	*1,800.00	Heat, cleaner, light, oil, matches, ink, mucilage, ice, water, soap, and elevator.
27	Cincinnati, Ohio	In public building, Fifth street between Walnut and Main streets.		
28	Cleveland, Ohio	In Society for Savings Building, on the Park	*1,140.00	Heat, cleaner, light, oil, matches, ink, mucilage, brooms, ice, water, toilet supplies, power for electric motor, and storeroom.

29	Columbia, Mo	In agricultural college building, campus State University.		
30	Columbia, S. C	In public building, corner Main and Laurel streets		
31	Columbus, Ohio	In Eberly Block, 203-215 South High street	*616.00	Heat, cleaner, light, oil, matches, ink, mucilage, brooms, ice, water, washing towels and flags, rent of telephone, gas for stereotyping, electric power for press, and district messenger service.
32	Concordia, Kans	Post-office building, on Sixth street	*220.00	Heat, cleaner, light, matches, and ice.
33	Corpus Christi, Tex	French's store, corner Chapparal and Star streets	*296.80	Heat, cleaner, light (oil), matches, ink, mucilage, brooms, and ice.
34	Davenport, Iowa	In public building, corner Fourth and Perry streets		
35	Denver, Colo	In public building, corner Sixteenth and Arapahoe streets		
36	Des Moines, Iowa	In public building, corner Fifth street and Court avenue		
37	Detroit, Mich	Union Trust Building, corner Griswold and Congress streets	*550.00	Heat, cleaner, electric light and power, oil, matches, ink, mucilage, brooms, ice, water, soap, and elevator.
38	Dodge City, Kans	Beeson Block, on Front street	*389.65	Heat, cleaner, light, matches, ink, mucilage, brooms, ice, water, soap, brushes, stove polish, and lavatory.
39	Dubuque, Iowa	Bank and Insurance Building, corner Main and Ninth streets.	*360.00	Heat, cleaner, light, and water.
40	Duluth, Minn	In public building, First street and Fifth avenue, west		
41	East Clallam, Wash	Telegraph office, Frontier street		
42	Eastport, Me	In public building, corner Water and Washington streets		
43	El Paso, Tex	In public building, St. Louis and Oregon streets		
44	Erie, Pa	In public building, Park Row and State street		
45	Eureka, Cal	In Buhne's brick building, corner Second and G streets	*334.65	Heat, cleaner, light, oil, matches, ink, mucilage, brooms, and water.
46	Evansville, Ind	In Fendrick Building, 215 Upper Fourth street		
47	Fort Smith, Ark	Hotel Main, Nos. 606 and 608 Garrison avenue	*240.00	Heat, cleaner, light, lard oil, matches, ink, mucilage, brooms, ice, water, soap, mops, brushes, dusters, and cleaning river gauge.
48	Fresno, Cal	Farmers' Bank of Fresno Building	*240.00	
49	Galveston, Tex	Cotton Exchange Building, Twenty-first and Mechanic streets.	*483.40	Heat, cleaner, oil, matches, ink, mucilage, brooms, ice, and soap.
50	Grand Haven, Mich	Cutler House, corner Third and Washington streets	*237.29	Heat, cleaner, light, oil, matches, ink, mucilage, and brooms.
51	Green Bay, Wis	Parmentier Block, 324-328 Washington street	*300.00	Heat, cleaner, light, matches, ink, mucilage, brooms, and soap.
52	Hannibal, Mo	In public building, corner Broadway and Sixth street		
53	Harrisburg, Pa	In public building, corner Third and Walnut streets		
54	Hatteras, N. C	In Styron's House, main road	*154.50	Heat, cleaner, light, oil, matches, ink, mucilage, brooms and soap.
55	Havre, Mont	In Gussenhoven Building, First street, between Third and Fourth avenues.	*480.00	Heat, cleaner, light, matches, brooms, ice, and water.
56	Helena, Mont	In Power Block, corner Main street and Sixth avenue	*420.00	Heat, cleaner, light, matches, ink, mucilage, brooms, ice, and soap.
57	Huron, S. Dak	Jeffris Block, 337 Dakota avenue	*325.00	Heat, cleaner, light, matches, ink, mucilage, brooms, ice, soap, and water-closet.
58	Idaho Falls, Idaho	In Graehl Hotel, corner Front and Shoup streets	*360.00	Heat, cleaner, light, matches, brooms, ice, water, and soap.
59	Indianapolis, Ind	In Majestic Building, 45 South Pennsylvania street	*1,000.00	Heat, cleaner, light, oil, matches, ink, mucilage, brooms, ice, and water.
60	Ithaca, N. Y	In Lincoln Hall, Cornell University		

* In accordance with existing lease.

	Station.	Location.	Rent.	
			Amount.	Includes—
	Jacksonville, Fla	In Astor Building, 138 West Bay street	*$600.00	Heat, cleaner, light, oil, matches, ink, mucilage, brooms, ice, telephone service, and electric light for signals.
	Jupiter, Fla	In Weather Bureau building, near light-house		
	Kansas City, Mo	In Rialto Building, corner Grand avenue and Ninth street.	*660.00	Heat, cleaner, light, brooms, ice water, and water.
	Keokuk, Iowa	In public building, corner Seventh and Blendeau streets		
	Key West, Fla	In Waite Building, corner Duval and Wall streets	*407.30	Cleaner, light, oil, matches, ink, mucilage, brooms, ice, and water.
	Kittyhawk, N. C	In Weather Bureau building, on the beach		
	Knoxville, Tenn	University of Tennessee		
	La Crosse, Wis	In public building, corner Fourth and State streets		
	Lander, Wyo	In Bunce & Iiam's Block, Main street	*360.00	Heat, cleaner, light, matches, brooms, and ice.
	Lansing, Mich	In Federal Building, corner Michigan and Capitol avenues.		
	Lincoln, Nebr	In University of Nebraska building, corner Twelfth and T streets.		
	Little Rock, Ark	In Miller Building, 202 East Markham street	*421.20	Heat, cleaner, oil, matches, ink, mucilage, and ice.
	Los Angeles, Cal	Wilson Building, 102½ South Spring street	*563.30	Heat, cleaner, light, matches, ink, mucilage, brooms, ice, and water.
	Louisville, Ky	In public building, corner Fourth and Chestnut streets		
	Lynchburg, Va	Law Building, 805-809 Main street	*270.00	Heat, cleaner, light, matches, ink, mucilage, brooms, ice water, and soap.
	Marquette, Mich	In public building, corner Third and Washington streets		
	Memphis, Tenn	In Continental National Bank, corner Main and South Court streets.	*600.00	Heat, cleaner, light, water, and elevator.
	Miles City, Mont	In Bryan & Larsen Building, corner Seventh and Main streets.	*168.00	Heat, light, oil, matches, ink, mucilage, and brooms.
	Milwaukee, Wis	In Mitchell Building, corner Michigan and East Water streets.	655.00	Heat, cleaner, light, oil, matches, ink, mucilage, brooms, ice, soap, elevator, and flagstaff.
	Minneapolis, Minn	In public building, corner Third street and First avenue south.		
	Mobile, Ala	In public building, corner St. Francis and Royal streets		
	Montgomery, Ala	In public building, corner Lawrence street and Dexter avenue.		
	Moorhead, Minn	In First National Bank, corner Front and Sixth streets	*265.25	Heat, cleaner, light, matches, ink, mucilage, brooms, ice, water, and soap.
	Nantucket, Mass	In Pacific Club House, corner Main and Water streets	*306.00	Heat, cleaner, light, ink, mucilage, brooms, ice, water, and electric light for signals.
	Narragansett Pier, R. I	In Odlen Cottage, Kingstown street	*150.96	Heat, light, matches, ink, mucilage, and brooms.
	Nashville, Tenn	In Chamber of Commerce, No. 307 Church street	*300.00	Heat, cleaner, light, matches, ink, mucilage, brooms, ice, and soap.
	Neah Bay, Wash	In Indian agency building, facing bay		
	New Brunswick, N. J	In New Jersey experiment station building, corner Bleecker place and Hamilton street.		
	New Haven, Conn	In Insurance Building, No. 890 Chapel street	*400.00	Heat, cleaner, light, matches, ink, mucilage, brooms, ice, water, and soap.
90	New Orleans, La	In public building, corner Decatur and Custom-house streets.		
91	New York, N. Y	In Manhattan Building, 66 Broadway		

92	Norfolk, Va	In Dodson Building, 53 Main street	*525.00	Heat, cleaner, light, oil, matches, ink, mucilage, brooms, ice, and water.
93	Northfield, Vt	In Norwich University, on Central street		
94	North Platte, Nebr	In Odd Fellows' Hall, corner Fifth and Spruce streets	*339.50	Heat, cleaner, light, matches, ink, mucilage, brooms, ice, and soap.
95	Oklahoma, Okla	In Opera House Block, corner Robinson street and Grand avenue.	*510.00	Heat, cleaner, light, ink, mucilage, brooms, ice, and water.
96	Omaha, Nebr	In McCague Building, corner Dodge and Fifteenth streets	*500.00	Heat, cleaner, light, and elevator.
97	Oswego, N. Y	In public building, Oneida street		
98	Palestine, Tex	In Colley-Wright Building, 1-5 Sycamore street	*314.00	Heat, cleaner, light, oil, matches, ink, mucilage, brooms, ice, water, and soap.
99	Parkersburg, W. Va	In public building, corner Fifth and Juliana streets		
100	Pensacola, Fla	In public building, corner Palafox and Government streets		
101	Philadelphia, Pa	In public building, corner Ninth and Chestnut streets		
102	Phœnix, Ariz	In Wharton Building, on Center street	*210.00	
103	Pierre, S. Dak	In National Bank of Commerce, corner Dakota avenue and Coteau street.	*370.00	Heat, cleaner, light, oil, matches, ink, mucilage, brooms, ice, water, and soap.
104	Pittsburg, Pa	In public building, Smithfield street, Third to Fourth avenues.		
105	Point Reyes Light, Cal	In light-house building		
106	Port Angeles, Wash	In Opera House Block, Front street	*180.00	Heat, light, ink, mucilage, brooms, lead pencils, pens, penholders, and dustpans.
107	Port Crescent, Wash	In Hart's Building, corner Third and A streets	*60.00	
108	Port Huron, Mich	In Federal Building, corner Sixth and Water streets		
109	Portland, Me	First National Bank, 57 Exchange street	*504.00	Heat, cleaner, light, oil, matches, ink, mucilage, brooms, ice, and soap.
110	Portland, Oreg	In Oregonian Building, corner Sixth and Alder streets	840.00	Heat, cleaner, light, and water.
111	Pueblo, Colo	In Swift Block, corner Sixth and Main streets	*300.00	Heat, cleaner, light, oil, matches, ink, mucilage, brooms, ice, water, soap, and flagstaff.
112	Pysht, Wash	In Merrill, Bliss & Co.'s Building	*100.00	
113	Raleigh, N. C	In Fisher Building, corner Fayetteville street and Exchange place.	*240.00	Water rent for water closet.
114	Rapid City, S. Dak	In Lakota Building, corner Seventh and St. Joe streets	*276.00	Heat, cleaner, light, oil, matches, ink, mucilage, brooms, ice, water, soap, brushes, dusters, and towels.
115	Red Bluff, Cal	In Cone & Kimball Building, corner Main and Walnut streets.	*396.25	Heat, cleaner, light, oil, matches, ink, mucilage, brooms, ice, and soap.
116	Richmond, Va	In Chamber of Commerce Building, corner Ninth and Main streets.	*580.00	Heat, cleaner, light, water, elevator, electric power for press, and gas for stereotyping furnace.
117	Rochester, N. Y	In public building, corner Church and Fitzhugh streets		
118	Roseburg, Oreg	In Marks Building, 228½ Jackson street	*309.00	Heat, cleaner, light, oil, matches, ink, mucilage, brooms, water, soap, and chimneys.
119	Sacramento, Cal	In public building, corner Seventh and K streets		
120	St. Louis, Mo	In public building, on Olive street, between Eighth and Ninth.		
121	St. Paul, Minn	In Chamber of Commerce Building, 112 East Sixth street	*300.85	Heat, cleaner, light, oil, matches, ink, mucilage, brooms, ice, soap, and chimneys.
122	Salt Lake City, Utah	In Board of Trade Building, 154 West Second South street	*400.00	Heat, cleaner, light, matches, and brooms.
123	San Antonio, Tex	In Maverick Bank Building, corner Houston street, Alamo Plaza.	*192.00	Heat, cleaner, light, and water.
124	San Diego, Cal	In Keating Building, corner Fifth and F streets	*360.00	Heat, cleaner, light, matches, ink, mucilage, brooms, and ice.

* In accordance with existing lease.

	Station.	Location.	Rent.	
			Amount.	Includes—
125	Sandusky, Ohio	In public building, corner Columbus avenue and Market street.		
126	San Francisco, Cal	In Mills Building, corner Bush and Montgomery streets	*$1,200.00	Heat, cleaner, light, and water.
127	San Luis Obispo, Cal	In Rackliffe Building, corner Choro and Marsh streets	*300.00	Heat, cleaner, light, oil, matches, ink, mucilage, brooms, ice, water, and soap.
128	Santa Fe, N. Mex	In Catron Building, corner Plaza on Palace avenue	420.00	Heat, light, and water.
129	Sault Ste. Marie, Mich	In News Building, 33 Ashmun street	*336.00	Heat, cleaner, light, matches, ink, mucilage, brooms, and soap.
130	Savannah, Ga	In Board of Trade Building, 108 Bay street	*325.00	
131	Seattle, Wash	In New York Building, corner Cherry and Second streets	*360.00	Heat, cleaner, light, and water.
132	Shreveport, La	In public building, corner Texas and Marshall streets		
133	Sioux City, Iowa	In public building, corner Sixth and Douglas streets		
134	Spokane, Wash	In Jamieson Building, 705 Riverside avenue	*480.00	Heat, cleaner, light, and water.
135	Springfield, Ill	In public building, corner Monroe and Sixth streets		
136	Springfield, Mo	In public building, corner Brown and Boonville streets		
137	Tacoma, Wash	In Chamber of Commerce Building, corner C and Ninth streets.	*240.00	Heat, cleaner, and light.
138	Tampa, Fla	In Knight Building, No. 315½ Franklin street	*317.75	Heat, cleaner, light, matches, ink, mucilage, and ice.
139	Tatoosh Island, Wash	In Weather Bureau building, northeast corner island		
140	Toledo, Ohio	In public building, corner Madison and St. Clair streets		
141	Topeka, Kans	In Columbian Building, 112 West Sixth avenue	*350.00	Heat, cleaner, light, ink, mucilage, brooms, ice, and water.
142	Valentine, Nebr	In Watson's Building, on Main street	60.00	Heat and light.
143	Vicksburg, Miss	In public building, corner Crawford and Walnut streets		
144	Vineyard Haven, Mass	In Eagleston Block, west side of Main street	*260.00	Heat, light, oil, matches, ink mucilage, brooms, ice, wicks, shades, and chimneys.
145	Walla Walla, Wash	In Paine Brothers' Building, corner Main and Second streets	*295.80	Heat, cleaner, brooms, and soap.
146	Wash Woods, N. C	In United States life-saving station building		
147	Wichita, Kans	In The Sedgwick, corner First and Market streets	*350.00	Heat, cleaner, light, oil, matches, ink, mucilage, brooms, ice, and soap.
148	Williston, N. Dak	Corner Main and Broadway	*300.00	Heat, cleaner, and light.
149	Wilmington, N. C	In public building, corner Front and Chestnut streets		
150	Winnemucca, Nev	In county courthouse, on Bridge street	*268.00	Heat, cleaner, light, matches, ink, mucilage, brooms, and water.
151	Woods Hole, Mass	In Fish Commission building, on Main street		
152	Yankton, S. Dak	In Union Block, corner Third and Walnut streets	*280.00	Heat, cleaner, light, matches, ink, mucilage, brooms, ice, water, and soap.
153	Yuma, Ariz	In public building, on Government reservation		
	Total		33,017.60	

*In accordance with existing lease.

ERECTION AND COST OF BUILDING FOR PRESERVATION OF PUBLIC RECORDS.

The act making appropriations for the fiscal year ending June 30, 1897, provides, in the fund for "Furniture, cases, and repairs," "that not more than $3,000 of this amount may be used for the erection of a fire-proof building or vault for the protection and preservation of the public records of the Department of Agriculture and certain valuable specimens." In compliance with this provision, a building was erected in the fall of 1896 in a suitable plot of ground directly in the rear of the main Department building, and disconnected from all the buildings on the reservation. This building is substantially constructed of brick, with slate roof and concrete floor, is 25 by 50 by 15 feet in the clear. The windows and door are protected by iron shutters, while over 6,000 feet of shelving are provided for the accommodation of public records and valuable specimens. The capacity of the building is sufficient, and will answer all purposes for which designed for years to come. The entire cost of the building was $1,650.66.

SPECIAL ACT RELATING TO ADDITIONAL COMPENSATION.

The attention of the honorable Secretary is specially invited to the provisions of section 2 of the act making appropriations for the Department of Agriculture for the fiscal year ending June 30, 1883. The section reads as follows:

> That no part of the money herein or hereafter appropriated for the Department of Agriculture shall be paid to any person, as salary or compensation, receiving at the same time other compensation as an officer or employee of the Government.

It may be proper to state that the passage of this section was due to the transaction of a former officer of the Department who, at the time, was in receipt of three distinct salaries from the Government. The circumstances surrounding the enactment of this law make its continued application peculiarly inequitable and discriminative. It applies only to the Department of Agriculture, and debars it from advantages and privileges enjoyed by the other Executive Departments; it seriously militates against the interests of the Government by prohibiting the employment of certain technical and expert labor that could be employed under the terms of the general law on the subject, and it imposes a hardship on the disbursing officer of the Department without furnishing any safeguard for his protection.

By the repeal of this section the Department of Agriculture would be placed on the same basis concerning the question of "additional compensation," and would be held by the same statutes which govern other Departments of the Government on the subject. This special act should be repealed or modified, or made to apply to all the Departments alike.

REVIEW OF WORK.

Of the large number of intricate accounts received, audited, and paid in this office during the last year all but a few have passed the accounting officers of the Treasury. When these shall have been certified, the books of this division will present a clean balance sheet to date, without a deficiency in any of the appropriations during the administration of the present chief of the Division of Accounts and Disbursements.

The present system of accounting by the Treasury is exceedingly rigorous in its strict application, demanding, on the part of disbursing officers, the utmost care, closest attention, and unyielding enforcement of the regulations, to avoid disallowances by the accounting officers of that Department. It is hoped that by the same methods now prevailing in this office, supplemented by the cooperation of the head of the Department, the record which has been established for the careful rendering of its accounts may be indefinitely continued. The work of the Division of Accounts and Disbursements is up to date, and the large volume of business transacted during the year has been disposed of in a most acceptable manner, as shown by the official records, while the employees of the division have fully maintained the high standard of efficiency which has marked their work in the past.

THE ACCOUNTS FOR THE FISCAL YEAR 1895 FINALLY CLOSED.

The accounts for the fiscal year ending June 30, 1895, having been finally closed and the balances of the appropriations carried to the surplus fund, the following statement of the appropriations, disbursements, and unexpended balances for that year is appended, being a continuation of the detailed statement submitted in the report of this office for 1895:

Objects.	Appropriations, 1895.	Total.	Amount of warrants.	Amount disbursed.	Amount unexpended.
Salaries, officers and clerks	$219,876.16	$249,876.16	$206,000.00	$181,115.21	$38,760.95
Messengers, laborers, mechanics, etc	20,000.00			15,388.62	4,611.38
Additional assistants in laboratory	10,000.00			8,085.89	1,914.11
Collecting agricultural statistics	100,000.00	110,000.00	96,119.92	88,584.73	11,415.27
Investigating foreign demands for United States agricultural products	10,000.00			6,540.94	3,459.06
Botanical investigations and experiments		30,000.00	25,695.30	25,695.30	4,304.70
Investigating the history and habits of insects	17,800.00	20,300.00	17,000.00	16,656.46	1,143.54
Cotton bollworm	2,500.00			166.41	2,333.59
Investigations in ornithology and mammalogy		17,500.00	15,526.35	15,526.35	1,973.65
Pomological information		5,000.00	5,000.00	4,920.23	79.77
Microscopical investigations		2,000.00	800.00	313.87	1,686.13
Vegetable pathological investigations and experiments		20,000.00	19,255.64	19,063.69	936.31
Laboratory, Department of Agriculture	6,000.00	14,900.00	11,119.23	2,551.87	3,448.13
Rent, laboratory buildings	900.00			900.00	
Investigation of soils	3,000.00			2,566.32	433.68
Adulteration of food	5,000.00			4,992.31	7.69
Fiber investigations		5,000.00	3,973.81	3,973.81	1,026.19
Report on forestry		20,000.00	20,012.18	19,908.23	91.77
llustrations and engravings		[illegible]	9,430.00	9,114.71	5,885.29
urchase and distribution of valuable seeds	130,000.00			[illegible]9,877.16	40,122.84
armers' bulletins	30,000.00			[illegible]5,739.65	4,260.35
rinting	5,400.00			[illegible]928.34	471.66
Document and folding room				[illegible]	833.17
xperimental gardens and grounds,					
iscellaneous expenses	11,000.00				4,195.11
[illegible] mental gardens and grounds					
[illegible]	18,500.00			[illegible]	1,726.78
use[illegible]		[illegible]	[illegible]	[illegible]889.73	1,110.27
urni[illegible]		[illegible]	[illegible]100.70	[illegible]952.27	2,047.73
ibra[illegible]		[illegible]	[illegible]963.20	[illegible]963.20	36.80
ostage		[illegible]	[illegible]	[illegible]65.00	4,235.00
utrition in [illegible]		[illegible]	[illegible]	[illegible]746.30	253.70
ontingent expense		[illegible]	[illegible]409.88	[illegible]452.79	4,547.21
gricultural experim[illegible]ation	[illegible]	[illegible]	4,928.27	[illegible]928.22	71.78
nquiries rel[illegible] public road		[illegible]	[illegible]	[illegible]	3,098.34
xperimen[illegible] manufactu[illegible]					
[illegible]				[illegible].80	3,811.20
[illegible]					

Objects.	Appropriations, 1895.	Total.	Amount of warrants.	Amount disbursed.	Amount unexpended.
Irrigation investigations		$6,000.00	$4,021.16	$3,904.88	$2,095.12
Quarantine stations for neat cattle		12,000.00	6,262.17	6,262.17	5,737.83
Salaries and expenses, Bureau of Animal Industry	$778,800.00	800,000.00	535,290.18	531,828.38	265,971.62
Rent of laboratory	1,200.00			1,200.00	
Additional temporary compensation to Chief of Bureau	1,000.00			1,000.00	
Total		1,628,476.16		1,200,338.44	428,137.72
WEATHER BUREAU.					
Salaries	165,105.78	165,904.78	147,800.00	146,159.95	18,945.83
Temporary employment of messengers and laborers	800.00			790.59	9.41
Fuel, lights, and repairs		8,000.00	7,800.00	7,039.67	960.33
Contingent expenses		10,000.00	5,250.00	4,950.39	5,049.61
General expenses, salaries	347,195.00	694,533.06	661,779.64	337,665.86	9,529.14
General expenses, miscellaneous	347,338.06			324,085.48	23,252.58
Total, Weather Bureau		878,438.84		820,691.94	57,746.90
Grand total		*2,506,915.00		2,021,030.38	485,884.62

* Including $7,891.94, or thirty-eight three hundred and sixty-fifths of the amount for statutory salaries of the year 1894. The act making appropriations for 1895 was not approved until August 8, 1894, making it necessary to continue the appropriations for 1894 to the latter date.

TABLE OF WEATHER BUREAU TELEGRAPH RATES.

It is deemed expedient to include in this report the following table of rates for telegraph service for the Weather Bureau over Western Union, International Ocean, Postal Telegraph-Cable, and Pacific Postal Telegraph-Cable Companies' lines for the fiscal year ending June 30, 1898. These rates are the same as for 1897 and have remained practically unchanged for several years past. The rates are fixed by the Secretary of Agriculture, by agreement with the companies performing the service:

Schedule of word rates.

All words, except place from and date, to be counted. Messages of less than twenty words to be charged at the rate for twenty words.]

Number of words.	Rate. 1 Distances 1,000 miles or less.	1½ Distances 1,001 to 1,500 miles.	1¾ Distances 1,501 to 2,000 miles.	1¾ Distances 2,001 to 2,500 miles.	2 Distances over 2,500 miles.
20	$0.20	$0.25	$0.30	$0.35	$0.40
21	.21	.26	.31	.36	.42
22	.22	.27	.33	.38	.44
23	.23	.28	.34	.40	.46
24	.24	.30	.36	.42	.48
25	.25	.31	.37	.43	.50
26	.26	.32	.39	.45	.52
27	.27	.33	.40	.47	.54
28	.28	.35	.42	.49	.56
29	.29	.36	.43	.50	.58
30	.30	.37	.45	.52	.60
31	.31	.38	.46	.54	.62
32	.32	.40	.48	.56	.64
33	.33	.41	.49	.57	.66
34	.34	.42	.51	.59	.68
35	.35	.43	.52	.61	.70
36	.36	.45	.54	.63	.72
37	.37	.46	.55	.64	.74
38	.38	.47	.57	.66	.76
39	.39	.48	.58	.68	.78
40	.40	.50	.60	.70	.80
41	.41	.51	.61	.71	.82
42	.42	.52	.63	.73	.84
43	.43	.53	.64	.75	.86
44	.44	.55	.66	.77	.88
45	.45	.56	.67	.78	.90
46	.46	.57	.69	.80	.92
47	.47	.58	.70	.82	.94
48	.48	.60	.72	.84	.96
49	.49	.61	.73	.85	.98
50	.50	.62	.75	.87	1.00
51	.51	.63	.76	.89	1.02
52	.52	.65	.78	.91	1.04
53	.53	.66	.79	.92	1.06
54	.54	.67	.81	.94	1.08
55	.55	.68	.82	.96	1.10
56	.56	.70	.84	.98	1.12
57	.57	.71	.85	.99	1.14
58	.58	.72	.87	1.01	1.16
59	.59	.73	.88	1.03	1.18
60	.60	.75	.90	1.05	1.20
61	.61	.76	.91	1.06	1.22
62	.62	.77	.93	1.08	1.24
63	.63	.78	.94	1.10	1.26
64	.64	.80	.96	1.12	1.28
65	.65	.81	.97	1.13	1.30
66	.66	.82	.99	1.15	1.32
67	.67	.83	1.00	1.17	1.34
68	.68	.85	1.02	1.19	1.36
69	.69	.86	1.03	1.20	1.38
70	.70	.87	1.05	1.22	1.40
71	.71	.88	1.06	1.24	1.42
72	.72	.90	1.08	1.26	1.44
73	.73	.91	1.09	1.27	1.46
74	.74	.92	1.11	1.29	1.48
75	.75	.93	1.12	1.31	1.50
76	.76	.95	1.14	1.33	1.52
77	.77	.96	1.15	1.34	1.54
78	.78	.97	1.17	1.36	1.56
79	.79	.98	1.18	1.38	1.68
80	.80	1.00	1.20	1.40	1.60
81	$0.81	$1.01	$1.21	$1.41	$1.62
82	.82	1.02	1.23	1.43	1.64
83	.83	1.03	1.24	1.45	1.66
84	.84	1.05	1.26	1.47	1.68
85	.85	1.06	1.27	1.48	1.70
86	.86	1.07	1.29	1.50	1.72
87	.87	1.08	1.30	1.52	1.74
88	.88	1.10	1.32	1.54	1.76
89	.89	1.11	1.33	1.55	1.78
90	.90	1.12	1.35	1.57	1.80
91	.91	1.13	1.36	1.59	1.82
92	.92	1.15	1.38	1.61	1.84
93	.93	1.16	1.39	1.62	1.86
94	.94	1.17	1.41	1.64	1.88
95	.95	1.18	1.42	1.66	1.90
96	.96	1.20	1.44	1.68	1.92
97	.97	1.21	1.45	1.69	1.94
98	.98	1.22	1.47	1.71	1.96
99	.99	1.23	1.48	1.73	1.98
100	1.00	1.25	1.50	1.75	2.00
101	1.01	1.26	1.51	1.76	2.02
102	1.02	1.27	1.53	1.78	2.04
103	1.03	1.28	1.54	1.80	2.06
104	1.04	1.30	1.56	1.82	2.08
105	1.05	1.31	1.57	1.83	2.10
106	1.06	1.32	1.59	1.85	2.12
107	1.07	1.33	1.60	1.87	2.14
108	1.08	1.35	1.62	1.89	2.16
109	1.09	1.36	1.63	1.90	2.18
110	1.10	1.37	1.65	1.92	2.20
111	1.11	1.38	1.66	1.94	2.22
112	1.12	1.40	1.68	1.96	2.24
113	1.13	1.41	1.69	1.97	2.26
114	1.14	1.42	1.71	1.99	2.28
115	1.15	1.43	1.72	2.01	2.30
116	1.16	1.45	1.74	2.03	2.32
117	1.17	1.46	1.75	2.04	2.34
118	1.18	1.47	1.77	2.06	2.36
119	1.19	1.48	1.78	2.08	2.38
120	1.20	1.50	1.80	2.10	2.40
121	1.21	1.51	1.81	2.11	2.42
122	1.22	1.52	1.83	2.13	2.44
123	1.23	1.53	1.84	2.15	2.46
124	1.24	1.55	1.86	2.17	2.48
125	1.25	1.56	1.87	2.18	2.50
126	1.26	1.57	1.89	2.20	2.52
127	1.27	1.58	1.90	2.22	2.54
128	1.28	1.60	1.92	2.24	2.56
129	1.29	1.61	1.93	2.25	2.58
130	1.30	1.62	1.95	2.27	2.60
131	1.31	1.63	1.96	2.29	2.62
132	1.32	1.65	1.98	2.31	2.64
133	1.33	1.66	1.99	2.32	2.66
134	1.34	1.67	2.01	2.34	2.68
135	1.35	1.68	2.02	2.36	2.70
136	1.36	1.70	2.04	2.38	2.72
137	1.37	1.71	2.05	2.39	2.74
138	1.38	1.72	2.07	2.41	2.76
139	1.39	1.73	2.08	2.43	2.78
140	1.40	1.75	2.10	2.45	2.80
141	1.41	1.76	2.11	2.46	2.82
142	$1.42	$1.77	$2.13	$2.48	$2.84
143	1.43	1.78	2.14	2.50	2.86
144	1.44	1.80	2.16	2.52	2.88
145	1.45	1.81	2.17	2.53	2.90
146	1.46	1.82	2.19	2.55	2.92
147	1.47	1.83	2.20	2.57	2.94
148	1.48	1.85	2.22	2.59	2.96
149	1.49	1.86	2.23	2.60	2.98
150	1.50	1.87	2.25	2.62	3.00
151	1.51	1.88	2.26	2.64	3.02
152	1.52	1.90	2.28	2.66	3.04
153	1.53	1.91	2.29	2.67	3.06
154	1.54	1.92	2.31	2.69	3.08
155	1.55	1.93	2.32	2.71	3.10
156	1.56	1.95	2.34	2.73	3.12
157	1.57	1.96	2.35	2.74	3.14
158	1.58	1.97	2.37	2.76	3.16
159	1.59	1.98	2.38	2.78	3.18
160	1.60	2.00	2.40	2.80	3.20
161	1.61	2.01	2.41	2.81	3.22
162	1.62	2.02	2.43	2.83	3.24
163	1.63	2.03	2.44	2.85	3.26
164	1.64	2.05	2.46	2.87	3.28
165	1.65	2.06	2.47	2.88	3.30
166	1.66	2.07	2.49	2.90	3.32
167	1.67	2.08	2.50	2.92	3.34
168	1.68	2.10	2.52	2.94	3.36
169	1.69	2.11	2.53	2.95	3.38
170	1.70	2.12	2.55	2.97	3.40
171	1.71	2.13	2.56	2.99	3.42
172	1.72	2.15	2.58	3.01	3.44
173	1.73	2.16	2.59	3.02	3.46
174	1.74	2.17	2.61	3.04	3.48
175	1.75	2.18	2.62	3.06	3.50
176	1.76	2.20	2.64	3.08	3.52
177	1.77	2.21	2.65	3.09	3.54
178	1.78	2.22	2.67	3.11	3.56
179	1.79	2.23	2.68	3.13	3.58
180	1.80	2.25	2.70	3.15	3.60
181	1.81	2.26	2.71	3.16	3.62
182	1.82	2.27	2.73	3.18	3.64
183	1.83	2.28	2.74	3.20	3.66
184	1.84	2.30	2.76	3.22	3.68
185	1.85	2.31	2.77	3.23	3.70
186	1.86	2.32	2.79	3.25	3.72
187	1.87	2.33	2.80	3.27	3.74
188	1.88	2.35	2.82	3.29	3.76
189	1.89	2.36	2.83	3.30	3.78
190	1.90	2.37	2.85	3.32	3.80
191	1.91	2.38	2.86	3.34	3.82
192	1.92	2.40	2.88	3.36	3.84
193	1.93	2.41	2.89	3.37	3.86
194	1.94	2.42	2.91	3.39	3.88
195	1.95	2.43	2.92	3.41	3.90
196	1.96	2.45	2.94	3.43	3.92
197	1.97	2.46	2.95	3.44	3.94
198	1.98	2.47	2.97	3.46	3.96
199	1.99	2.48	2.98	3.48	3.98
200	2.00	2.50	3.00	3.50	4.00

REPORT OF THE ENTOMOLOGIST.

U. S. DEPARTMENT OF AGRICULTURE,
DIVISION OF ENTOMOLOGY,
Washington, D. C., July 29, 1897.

SIR: I submit herewith an executive report covering the operations of the Division of Entomology for the fiscal year ending June 30, 1897, dividing it, in accordance with the directions contained in your circular letter of June 21, into the following sections:

(1) A brief report of the operations carried on during the fiscal year 1897.

(2) An outline of proposed work for the fiscal year 1898.

(3) Suggestions as to work for the fiscal year 1899, for use in preparing estimates.

Respectfully,

L. O. HOWARD,
Entomologist.

Hon. JAMES WILSON, *Secretary.*

WORK OF THE YEAR.

The amount appropriated by Congress for entomological investigations (aside from the salaries provided for by the statutory roll) was $20,000. Of this amount there was expended the sum of $19,114.76, leaving an unexpended balance, which was covered into the Treasury, of $885.24. The main items of expense may be grouped as follows: Salaries of investigators and other employees, stationed for the most part in Washington, D. C., $13,355.70; salaries of field agents, $958.07; miscellaneous office supplies and expenses, $3,371.43; traveling expenses, $1,429.56. Of the salaries for investigators and other employees the amount expended for scientific assistants has been $9,695.70, and for clerical and other assistants $3,660.

The work of the division may be classified, as in former years, under the following heads:

(*a*) Investigations upon specific injurious insects or groups of insects.

(*b*) Experiments with insecticides and insecticide machinery.

(*c*) Determination of specimens sent in by the entomologists of the State experiment stations and by other workers.

(*d*) General investigations of the life histories of injurious insects.

(*e*) Work on geographic distribution of injurious insects.

(*f*) Bibliographic work.

(*g*) Preparation of circulars of information.

(*h*) Correspondence.

(*i*) Mounting and preparation of specimens for permanent preservation.

(*j*) Preparation and proof reading of bulletins and reports.

(*k*) Work upon the exhibit of insects for the Nashville Exposition.

Briefly summarized, the work of the division under each of these heads has been as follows:

(*a*) The investigation of the San Jose scale, mentioned in the last two annual reports, was practically completed with the publication of Bulletin No. 3, new series, issued during the fiscal year 1896. Some supplementary investigations were made, however, during the fiscal year 1897, but these related principally to the spread of the species, the life history having already been fully ascertained and the best remedies determined. Very many new localities in the Eastern States have been found, but in this line of work the State experiment stations have shown great interest and have practically taken the investigation into their own hands, as seems eminently proper. Nevertheless, accurate records are kept at the office, so that at any time a supplementary bulletin may be published. The State experiment station workers, as well as fruit growers, however, have found great difficulty in distinguishing between the San Jose scale and several closely allied species which occur upon fruit trees. The result has been that this office has been kept busy by requests from such persons for the examination of scale insects sent in in order to decide their identity. There has, therefore, been prepared during the year a technical bulletin entitled "The San Jose Scale and its Nearest Allies; a Brief Consideration of the Characters Which Distinguish these Closely Related Injurious Scale Insects." It has been the aim in this bulletin to display by exact contrast the distinguishing characters of these allied species, so as to enable all entomologists as well as other persons who have access to a compound microscope to determine definitely whether or not the specimen before them is the San Jose scale.

The Mexican cotton-boll weevil has again attracted comparatively little attention. An agent spent some time in the field in the autumn of 1896, and it was found that owing to the extreme drought of the preceding summer comparatively little damage had been done by this insect, and it had not seriously exceeded the boundaries of spread as laid down in the fall of 1895. In the spring of 1897 the same agent visited infested points and later went to Mexico for the purpose of studying the insect in its original home, particularly for the purpose of ascertaining whether parasites exist there which could be imported into Texas with benefit.

The investigation of the insects of the household, mentioned in the last report, was duly completed and the results published in Bulletin No. 4, new series, of the division. There was a great demand for this bulletin and the edition was practically exhausted. The same may be [illegible] Bulletin [illegible] new series, a report upon insects affecting [illegible] edition of which has been exhausted for some [illegible] been ordered to fill the constant demand. [illegible] suggestion connected with household insects [illegible] of a low degree of temperature upon insects [illegible] the kindness of one of the cold-storage com- [illegible] facilities were afforded and the exact degree [illegible] moth insects and insects affecting woolen [illegible] active, was definitely [illegible] new series. The

results of this investigation indicated the possibility of a very considerable saving to cold-storage companies and consequent possible reduction in the charges for storing goods through the summer months.

The investigation of the general subject of insects injurious to shade trees in cities and towns has been continued. Two preliminary papers have been published in the Yearbooks of the Department for 1895 and 1896, and in Bulletin No. 5, technical series, published in May, 1897, is given an account of the principal factors which brought about the almost total disappearance of tussock moth larvæ on the shade trees in the city of Washington during the summer of 1896. The investigations upon which this bulletin is based were made almost entirely during the fiscal year, and the bulletin is, in fact, a typical study of the sudden interruptions, by parasitism, which so frequently occur with many injurious outbreaks of insects of economic importance. A general report is under way.

The investigation of insects affecting stored foods, mentioned in previous reports, is making progress. New discoveries have extended its scope, and several of these have been reported upon in Bulletin No. 8, new series, entitled "Some Little-known Insects Affecting Stored Vegetable Products," published in March, 1897. A chapter on insects affecting cereals and other dry vegetable foods was published in Bulletin No. 4, new series, and a Farmers' Bulletin on insects injurious to stored grain has also been published.

Considerable time was spent during the year in preliminary work upon a general popular bulletin, to be arranged in encyclopedic form, on the principal injurious insects of the United States. This work has consisted largely in the preparation of illustrations, since it is desired to have it as fully illustrated as possible. Further, in connection with this work, sundry investigations have been carried on concerning certain insects affecting garden crops, and a preliminary paper upon the two imported asparagus beetles was published in the Yearbook for 1896.

The preparation of the extended report on insects affecting citrus fruits and fruit trees, mentioned in the last two consecutive reports, has been interrupted, temporarily at least, and very much to my regret, by a serious breakdown in the health of the investigator in charge of the work. The date of its completion, therefore, can not be approximated.

The division has devoted some time during the year to the consideration of the dangers of the importation of new insect pests from abroad. Early in the fiscal year there was published a technical bulletin entitled "Some Mexican and Japanese Injurious Insects Liable to be Introduced into the United States," and the Entomologist prepared and delivered an address before a convention of horticulturists, nurserymen, and entomologists, held in Washington in March, 1897, on the subject of the desirability of an inspection system against foreign insects, in which he considered at some length the injurious species which may at any time be brought by commerce into the United States. The convention before which this paper was read was a large and representative one, and the main result of the meeting was the drafting of a bill providing an inspection system, which was placed in the hands of Congress. The National Nurserymen's convention, held in St. Louis in June, decided upon a bill of a somewhat similar nature and urged its passage upon Congress.

The occurrence during May, 1897, of two broods of the periodical cicada has caused a very considerable demand for information regard-

ing this insect. Circulars were sent early in the season to all the localities in which this insect would probably appear, and accurate information regarding the distribution of the two broods has been gained. Work was begun upon a complete account of the life history and distribution of this insect, such as has not before been published. It will form an elaborate revision of Bulletin No. 8, old series.

Apropos to the investigation of the Mexican cotton-boll weevil, new observations were made upon insects affecting the cotton plant, and a chapter upon cotton insects was prepared for the Handbook of Cotton Culture, published by the Office of Experiment Stations. This chapter was subsequently revised and published as Farmers' Bulletin No. 47.

During the summer of 1896 reports of grasshopper injury in Nebraska and adjoining States were received with such frequency that a special agent was employed for two months to make a tour of investigation, his report being published in Bulletin No. 7, new series.

The technical work of the division, aside from that reported upon in the two technical bulletins already mentioned, is comprised in a revision of the parasitic flies of the family Tachinidæ in North America, which has been completed and is now in the hands of the Division of Publications. Two other monographic works are approaching completion.

(*b*) A series of experiments with new and old insecticides has been carried on during the year, principally with relation to their effects upon foliage of different plants under varying conditions. The assistant in charge of this work visited California in the autumn of 1896 for the purpose of studying the methods of insect control in that State, and has reported in brief in the Yearbook for 1896. In May of the present year, soon after the change of administration, the Entomologist was allowed to have constructed a gasoline motor spraying apparatus of the most approved type for experimental work. This apparatus, which embodies the latest ideas in spraying machinery, does excellent work and will enable the carrying on of important experiments.

(*c*) The work of the division in the way of determining specimens sent in by the entomologists of the State experiment stations and by other workers in economic and systematic entomology continues to be very heavy. It was hoped that with the gradual increase of the libraries and collections of the State experiment stations this work would gradually become less onerous. Instead, it seems to be increasing. Something over 6,000 insects were named for such workers during the fiscal year, and this work consumes no small part of the time of four of the expert assistants, who are specialists in different groups.

(*d*) General investigations of the life histories of injurious insects are carried on in the insectary building and the adjoining garden plot. [illegible] the fiscal year notes were recorded upon 502 species which had [illegible] before been studied in the insectary. The catalogue number [illegible] of insects so studied [illegible] June 30, 1897,

[illegible] injurious insects [illegible] States, which was [illegible] outli[illegible] the last annual [illegible] progressi[illegible] [illegible] litions [illegible] is needed [illegible]

[illegible] American Eco- [illegible] course of preparation for [illegible] fiscal year. The work as

a whole now includes five published parts, covering in all 800 pages, and bringing the bibliography from the first published paper down to July 1, 1888. Through the United States Civil Service Commission an assistant has been especially appointed to prosecute this bibliographic work. He is engaged in cataloguing the literature of American economic entomology from July 1, 1888, down to the close of the calendar year 1896. It is hoped eventually to publish this matter as a supplementary part to the bibliography already published, and thereafter to publish annual supplements. There has also been prepared and published during the year a general index to the seven volumes of Insect Life, the periodical bulletin published by the division during the fiscal years 1888–89 to 1894–95.

(*g*) Seven circulars of information concerning insects of prime economic importance were published during the year, and one of them, viz, that upon the Mexican cotton-boll weevil, in two supplementary editions—the one in Spanish and the other in German—for the benefit of cotton planters in south Texas who are unfamiliar with English. The demand for these circulars and the frequent use which is made of them in correspondence amply justifies the continuation of the series.

(*h*) The correspondence of the division was unusually heavy. Aside from many communications which were answered by circulars, 6,300 answers to inquiries concerning injurious insects were sent out.

(*i*) The connection between the Department of Insects of the National Museum and the Division of Entomology was explained in the last annual report, in which it was shown that the specimens prepared for permanent keeping are in the main deposited in the National Museum. The records for the fiscal year show an addition of 13,217 specimens to the collection, the larger share of which came through the Department of Agriculture and were deposited by the Division of Entomology, the majority of them having been mounted and prepared in this division.

(*i*) The publications of the division for the fiscal year will be listed in the report of the chief of the Division of Publications. In addition to the seven circulars mentioned, there have been published five bulletins of the general series, three of the technical series, Part V of the Bibliography of American Economic Entomology, the General Index to Insect Life, four articles in the Yearbook for 1896, and two Farmers' Bulletins, making a total of 1,362 printed pages.

(*k*) The exhibit of insects at the Nashville Exposition is practically the same as that prepared during the two previous years for the Atlanta Exposition. It required some work, however, in the way of renewing damaged specimens and altering labels. One case of new material was added and an assistant was sent to Nashville for the purpose of installing the exhibit.

PROPOSED WORK FOR THE FISCAL YEAR 1898.

The work along certain general lines indicated in the foregoing sections will be prosecuted. The Mexican cotton-boll weevil will be carefully watched. Further efforts will be made to obtain Mexican parasites, and the supplemental circular will be issued if necessary. The investigation of insects injurious to shade trees, insects affecting stored foods, insects affecting citrus fruits, geographical distribution of injurious insects in this country, bibliographical work, experimental work with insecticide machinery will all be continued. Another

investigation will be made upon the injurious grasshoppers of the far West. As explained in previous reports, it is impossible to anticipate the special subjects for investigations which it may at any time become necessary to undertake. The beginning of nearly every season brings some injurious species prominently to the front, and when this species has not already been investigated, new work must be begun. There has long been need of a complete practical bulletin on the subject of the Hessian fly. Aside from a short circular, nothing has been published by the Department concerning this insect since 1882. It is planned during the fiscal year to prepare such a bulletin, and the work has been placed in charge of Prof. Herbert Osborn, of the Iowa State Agricultural College.

A similar work relating to the chinch bug is also a great desideratum. Such a work will also be prepared during the coming year, and it has been placed in the hands of Prof. F. M. Webster, of the Ohio State Agricultural Experiment Station. For several years there has been upon the roll of the division one of the best-informed men on matters relating to apiculture in the United States. He was the author of Bulletin No. 1, new series, entitled "The Honey Bee: A Manual of Instruction in Apiculture," and has prepared a Farmers' Bulletin upon the same subject. By order of Secretary Morton the apicultural work of the division was stopped at the publication of Bulletin 1, and this assistant has recently been employed in other office work. It seems to the writer that experimental work in apiculture comes properly under the head of "Entomological investigations," and while he does not deem it wise to recommend any considerable expenditure of the small fund appropriated for such investigations in this way, he would be glad to institute, with the approval of the present Secretary, some experimental work in apiculture, utilizing the services of this assistant in its supervision. The honey producing industry is a large and growing one, and deserves some slight encouragement of this sort at the hands of the Government.

SUGGESTIONS AS TO WORK FOR THE FISCAL YEAR 1899 FOR USE IN PREPARING ESTIMATES.

The services of an additional assistant, at, say, $1,200 per annum, could be very profitably utilized in the general work of the office, and I respectfully recommend that in the estimates of the Secretary such an assistant be added to the statutory roll. In view of what has been said in the preceding paragraph, it would seem desirable that a special appropriation of $2,500, for experimental work in apiculture, be added to the fund for entomological investigations.

REPORT OF THE DIRECTOR OF THE OFFICE OF EXPERIMENT STATIONS.

U. S. DEPARTMENT OF AGRICULTURE,
OFFICE OF EXPERIMENT STATIONS,
Washington, D. C., September 1, 1897.

SIR: I have the honor to present herewith the report of the Office of Experiment Stations for the fiscal year ending June 30, 1897.

Respectfully,

A. C. TRUE, *Director.*

Hon. JAMES WILSON, *Secretary.*

WORK OF THE YEAR.

SUPERVISION OF EXPENDITURES OF EXPERIMENT STATIONS.

The second annual examination of the work and expenditures of the agricultural experiment stations, with special reference to the fiscal year ending June 30, 1896, was made during the past year in accordance with the authority conferred upon the Secretary of Agriculture by Congress, and a report of this investigation was prepared for transmission to Congress, as required by law. This report was published as Senate Document No. 137 (Fifty-fourth Congress, second session), and the copies assigned to this Department were distributed to the governing boards and officers of the experiment stations. The nature of the report and the general results of the investigation regarding the management and expenditures of the stations are indicated by the following statements, taken from the report:

As was the case last year, the report is based on three sources of information, viz, the annual financial statements of the stations rendered on the schedules prescribed by this Department, the printed reports and bulletins of the stations, and the reports of officers of this Department who made personal examinations of the work and expenditures of the stations.

While this is the second report of this character, it should be stated that owing to unavoidable delay in receiving the reports of the stations for the previous fiscal year it was impracticable for the Department to make a complete survey of the operations of the stations in relation to their expenditures until a large portion of the fiscal year covered by the present report had expired. For this reason the views of the Department with reference to details of expenditures and methods of accounting were not formulated for the information of station officers in season to affect the accounts of the past fiscal year. It thus happens that at some stations expenditures were made and methods of accounting pursued which in the view of this Department could not be justified by the terms and spirit of the law. There has, however, been a general disposition on the part of station officers to conform to the views of the Department in these regards as soon as a clear understanding of their import was reached. As a result of the correspondence and conferences between this Department and the stations, the business of the stations has been more thoroughly systematized, the scope and limitations of their operations have

been more clearly recognized, and their relations to the educational institutions of which they are departments have been more closely defined.

The general causes which have hitherto weakened the operations of our stations, as shown in my previous report, have of course still continued to work to their disadvantage, and will undoubtedly hamper them more or less in the years to come. There have, however, been many encouraging indications during the past year, that clearer notions of the proper functions of experiment stations as organizations for the application of scientific research to the practical needs of agriculture are beginning to prevail, even in quarters where hitherto there has seemed to be the most misapprehension regarding their rightful work. As new officers are appointed in the stations there is a closer scrutiny of their previous training and experience as related to the work they are expected to undertake. In securing chief officers to plan and conduct the more important researches there is a growing competition to have the best men. While this is bringing into bolder relief the scarcity of the thoroughly competent material for this purpose, it is stimulating the ambition and activity of station officers, who can now more confidently look forward to a reasonable degree of success if their efforts in agricultural research are strenuous and well directed. We can thus hope that the ranks of well-trained and efficient administrators and investigators will more speedily be filled.

There are evidences that the wisdom of concentrating the work of individual stations on a few subjects which can be thoroughly treated is being more deeply impressed on station managers. During the past year the establishment of substations, to be supported with the national funds, has been stopped, a number of those already organized have been closed, and arrangements are being made to withdraw from others as fast as the best interests of the work will permit. On the other hand, through the liberality of State legislatures and local communities, some stations have been enabled to wisely extend their operations on the basis of adequate financial support, and in general it may be said that the stations are striving to find out what are the most important agricultural needs of their respective regions which can be aided by scientific research, and are directing their efforts toward supplying these needs in a broad way and for the good of the greatest number.

There has, perhaps, been some misapprehension as to the purpose of this Department in advocating the withdrawal of the national funds from the support of permanent substations. This has not been done with a view to confining the operations of the stations to the laboratories and lands immediately contiguous to the institutions with which they are connected. It is rather that these funds may be utilized as circumstances may require for the general good of the agriculture of the several States and of the whole country. The great evil which has attended the maintenance of permanent substations with the limited funds given to each State from the National Treasury has been that it has involved large expenditures for farm operations and superficial experimenting in a few favored localities and thus prevented the carrying on of more thorough investigations for the general benefit of the agriculture of the State. If there were abundant means for the purpose, there would, of course, be good reason for the establishment of what might be called "fields of demonstration" at different points in the State where improved methods of agriculture and simple experiments, such as the testing of varieties of field crops and fruits, could be carried on for the instruction of the neighboring farmers. This is done successfully in France and other European countries. But this is hardly agricultural research, and experience shows that where funds for that purpose are limited it is far better to concentrate them on the more general problems of agriculture, and to manage them in such a way that thorough researches can be conducted under such limitations regarding the localities in which they are to be made as the nature of the particular investigations in progress demand.

If a new plant is to be tested with reference to its adaptation to a given State, the effort should be to have it thoroughly tried in as many localities as practicable. This has been successfully done in recent years with the sugar beet in many States. If soils are to be studied, typical specimens should be taken from as many different soil areas as practicable. If the station undertakes to investigate problems affecting one or two localities only, it should be in a position to withdraw from this investigation when the work is accomplished. If the national funds are reserved for operations emanating from the stations regularly organized under the law, in connection, as a rule, with the land-grant colleges, it is believed they will be productive of far greater good to agriculture than if they are largely spent in the maintenance of substations organized as to be perpetually confined to particular localities and operations.

[illegible] ency in the personnel

and operations of the stations is being more generally recognized. In some places, it is true, during the past year radical reorganizations of the station staffs have occurred. Here and there changes have apparently been due to political influence or to an unreasonable spirit of restlessness more difficult to account for. These, however, are manifestly the weak spots in our station system. The stations which are doing good work and accomplishing the best results are holding steadily to the lines of work which they have marked out, and are changing their forces only as necessity or good and sufficient reasons compel. As the stations where vacillating policies prevail fall more distinctly behind their fellows, it is to be expected that local pride and the demands of an awakening public spirit will compel a readjustment of their affairs on a proper basis.

On the whole, the station enterprise in this country has enjoyed a year of prosperity. Its work has been regularly pursued, new fields of usefulness have been occupied, much helpful knowledge has been acquired, and a great mass of useful information has been broadly disseminated. On all sides we hear of increased demands from the farmers for the information which the stations have to give. Station officers are constantly being urged and tempted to interrupt the search after new truth in order that they may set forth more clearly, and systematically, in the language of the people, the results of previous investigations in the realm of agricultural science in this country and abroad. It is more necessary now than ever before to urge that the stations be left to carry on their legitimate work of research. As the investigations of the stations develop in thoroughness and complexity, there is increasing danger of failure and disappointment if they are interfered with or diverted. We are glad to be able to say that thus far the station workers have been able to extend their inquiries year by year, while at the same time they have in large degree met the demand for immediately practical information. That the benefits of station work are realized by increasing numbers of our farmers is well shown in the general disposition of the States and local communities to supplement the funds given by the national Government. Wherever stations are doing thorough work there is a rising tide of popular support for their enterprises, and we may confidently expect a greater development of this movement in the not distant future.

As the result of the action of Congress requiring systematic examination of the work and expenditures of the stations by United States officers, the national funds devoted to this great enterprise are expended with greater carefulness and a closer scrutiny of the legitimacy and desirability of proposed expenditures, the stations are being brought closer together, so as to form more truly a great national system of agricultural research, the various parts of which have freedom of initiative and action conformable to our general scheme of government and education, and the basis is being laid for a standard of comparison of the usefulness and success of their operations which shall rest on the consensus of qualified observers and critics of their work wherever they may be found.

Agricultural experiment stations are now in operation under the act of Congress of March 2, 1887, in all the States and Territories. Alaska is the only section of the United States which has no experiment station. In each of the States of Alabama, Connecticut, New Jersey, and New York a separate station is maintained wholly or in part by State funds, and in Louisiana a station for sugar experiments is maintained mainly by funds contributed by sugar planters. The separate station maintained for many years by the State of Massachusetts has been combined with the Hatch Experiment Station in that State. Excluding the branch stations established in several States, the total number of stations in the United States is 54. Of these, 52 receive the appropriation provided for in the act of Congress above mentioned. The total income of the stations during 1896 was $1,133,791.23, of which $720,000 was received from the National Government, the remainder, $413,791.23, coming from the following sources: State governments, $267,663.10; individuals and communities, $5,124.75; fees for analyses of fertilizers, $51,884.95; sales of farm products, $69,806.50; miscellaneous, $19,311.93. In addition to this the Office of Experiment Stations had an appropriation of $30,000 for the past fiscal year. The value of additions to equipment of the stations in 1896 is estimated as follows: Buildings, $76,175.24; libraries, $10,902.68; apparatus, $14,753.95; farm implements, $19,103.76; live stock, $19,503.55; miscellaneous, $2,416.56; total $148,776.13.

The stations employ 584 persons in the work of administration and inquiry. The number of officers engaged in the different lines of work is as follows: Directors, 68; chemists, 121; agriculturists, 64; horticulturists, 65; farm foremen, 25; dairymen, 20; botanists, 40; entomologists, 42; veterinarians, 26; meteorologists, 19; biologists, 15; physicists, 7; geologists, 6; mycologists and bacteriologists, 21; irrigation engineers, 6; in charge of substations, 33; secretaries and treasurers, 25; librarians, 8; and clerks, 31. There are also 16 persons classified under the head of "miscellaneous," including superintendents of gardens, grounds, and buildings;

apiarists; herdsmen, etc. Two hundred and sixty-six station officers do more or less teaching in the colleges with which the stations are connected.

During 1896 the stations published 45 annual reports and 323 bulletins. Besides regular reports and bulletins, a number of the stations issued press bulletins, which were widely reproduced in the agricultural and county papers. The mailing lists of the stations now aggregate about half a million names. Correspondence with farmers and calls upon station officers for public addresses at institutes and other meetings of farmers are constantly increasing. The station officers have contributed numerous articles on special topics to agricultural and scientific journals.

As some of the stations did not render their financial reports for the preceding fiscal year until February 1, 1897, which is the date fixed by law for the issuance of these reports, it was not found practicable for this office to complete its second report on the expenditures of the stations until after that time. This prevented the transmission of the report to Congress until after the appropriations for experiment stations for the current fiscal year had been decided upon. This is an unfortunate arrangement as regards all the parties concerned. Congressional committees should have before them the information which this report supplies when considering the appropriation for the stations for the ensuing fiscal year, and it would be more satisfactory to the stations if the report of their work and expenditures for the fiscal year just past was in the hands of these committees, rather than that they should base their judgment on older reports. Especial effort is being made to secure prompt return of the financial reports of the stations for the fiscal year just ended, and it is hoped that it will be found practicable hereafter to transmit the report of this Department on the work and expenditures of the stations to Congress at the opening of its session in December.

The schedules for the financial reports for the fiscal year ended June 30, 1897, as prescribed by the Secretary of Agriculture, have been forwarded to the stations, and the visitation of the stations with reference to the work and expenditures of that year is well under way.

The usefulness of the supervision of the expenditures of the stations by this Department has been clearly demonstrated and is generally acknowledged by station officers. While the act of Congress under which the stations are conducted is drawn in such general terms that the definition of the legal limit of expenditures under it is a difficult matter, the influence of the Department in aiding the stations to so conduct their work that the agricultural interests of the country will derive the greatest benefits is by no means confined to its decisions affecting particular expenditures by the stations. As the result of close personal contact with the officers of the stations and the wide and impartial observation of the workings of the experiment stations in this and other countries, this office is enabled to bring to the stations the accumulated fruits of experience in the management of the station business. In this way it has already been able to accomplish much in supporting the efforts of station officers to raise the grade of their work and in preventing attempts to broaden out the operations of the stations beyond proper limits or to force their work in special directions under the guidance of popular clamor or other undue influence exerted in behalf of ill-considered and impracticable enterprises.

The investigations of the affairs of the stations which this office has conducted have served to bring out in clear relief some of the most serious difficulties in the proper administration of the stations. They have also served to show how complex are many of the problems relating to station management. It is much plainer now than at any pre-

vious time that the experiment stations provided for by the act of Congress of March 2, 1887, were given such large and varied functions, that one of the prime requisites of their successful management is a firm determination on the part of their managers to hold the work of individual stations within comparatively narrow lines. The clear apprehension of this necessity is all the more important from the fact that such has been the success of the stations in ministering to the needs of the farmers in different localities that there never was a time when the individual stations were pressed with greater earnestness to engage in all sorts of enterprises which it is claimed will benefit this or that agricultural industry. Large numbers of our agricultural population are just beginning to realize the importance of the work of the stations, but have not yet come to appreciate the necessary limitations on that work if it is to be thoroughly successful. There is, therefore, more need than ever of the support which this Department may give to keep the stations from being swept from their moorings.

The Department has also still an important work to perform in impressing upon officers charged with the general management of the colleges, with which the stations are as a rule connected, that it is their duty to make separate and distinct provision for agricultural education in their institutions without drawing directly or indirectly upon the resources of the stations intended for original investigations to advance our knowledge regarding the best methods of agricultural practice and the principles on which this should be founded. Hopeful progress has been made in this line of work, but there is yet room for improvement in a number of places.

It has been clearly shown during the past year that one of the weakest points in the management of the stations lies in what may be termed the general irresponsibility of their governing boards. Members of these boards are quite generally appointed by the governors of the States and Territories for short terms, and their controlling membership is too often made to shift with each gubernatorial election. In the appointment of station officers and in the determination of the general policy of the station these boards are too often guided by considerations growing out of their ignorance of the proper functions of experiment stations or a desire to accomplish showy, even if superficial, results before their term of office expires. The general result is that too many of our stations lack those elements of permanency in their personnel and work, which alone will enable them to conduct investigations justifying the liberal provision made by Congress for their support.

The constant shifting of the membership of the governing boards of some stations makes it very difficult for this Department to exert any beneficial influence on their operations. Plans of work adopted by one board, after careful planning by the expert officers of the station, are often entirely frustrated by the incoming of a new board, which appoints other officers and adopts other schemes of its own devising. The confusion thus created in station affairs may amount to a virtual waste of thousands of dollars of the national funds—a state of things which under existing conditions this Department is powerless to avert.

As long as such a vacillating policy is pursued by a considerable number of the States and Territories, which are beneficiaries of the Congressional grants for experiment stations, it must be affirmed that the present method of administering these funds is not thoroughly satisfactory, and that it is still an open question whether more explicit

conditions regarding the disposition of these funds should not be imposed by Congress, at least in cases where States have themselves failed to establish sufficient safeguards for their proper expenditure. Nevertheless, it is still hoped that by patient insistence on the principles which must underlie the successful management of the stations and by the dissemination of impartial information regarding their merits and deficiencies it may be possible to secure a more efficient and economical management of the stations in all parts of the country.

In view of the great success which has attended the efforts of the stations when properly managed, and the increasing need of thorough investigations on behalf of agriculture in all sections of our country, it is certainly much to be deplored that any of our stations should be in a weak condition. Intelligent friends of agricultural progress should everywhere rouse themselves to give the station officers that support which will enable them to conduct their work, without interference, on subjects and by methods which experience has shown most productive of practical and lasting results.

It will readily be perceived that the discharge of the delicate duties involved in the present relations of this office with the stations involves a large amount of painstaking work. A very considerable amount of time must be expended in visiting the stations to gain an adequate acquaintance with the conditions under which their work is performed. Their reports and bulletins must be carefully weighed in the light of the circumstances under which they were produced. The fact that the influence of the Department on the station work must necessarily be confined to the general principles of their management, and be advisory rather than mandatory in its character, calls for the exercise of great prudence and tact on the part of the agents of the Department in its dealings with the stations. How far this office has accomplished what might reasonably be expected of it in this line of work may safely be left to competent judges of such matters to decide. It is, however, important that the extent of the burden involved in this service should be considered in determining the needs of the office as regards personnel and resources, and it is easy to understand that it is more difficult to apply exact standards of measurement to this work than to that involved in the ordinary routine of official business or the preparation of publications.

EXPERIMENT STATIONS IN ALASKA.

In the Report of the Director of the Office of Experiment Stations for 1896 a suggestion was made "that Congress be asked to make a moderate appropriation to enable the Secretary of Agriculture to investigate and report to Congress upon the agricultural resources and capabilities of Alaska, with special reference to the desirability and feasibility of the establishment of agricultural experiment stations in said Territory and the selection of suitable locations for such stations." This recommendation was indorsed by the honorable Secre- [illegible] agriculture (see Report of Secretary of Agriculture for 1896, [illegible] in accordance with his estimates an appropriation of [illegible] made by Congress for this purpose. This appropriation [illegible] available until the beginning of the current fiscal year, [illegible] urgent need of definite information regarding the [illegible] Territory steps were taken as soon as [illegible] appropria[illegible] to carry [illegible] the investigation during [illegible] available [illegible] information regarding the

agricultural resources and capabilities of Alaska which could be derived from Government reports and other sources was collated, and arrangements were made for a personal inspection of the Territory for the purposes named in the act aforesaid.

A commission, consisting of Mr. Benton Killin, a member of the board of regents of the Oregon Agricultural College, and a man thoroughly familiar with the agricultural conditions on the Pacific Coast, and Dr. W. H. Evans, botanical expert of this office, was dispatched to visit the coast and island region of Alaska from its southern boundary as far north as Unalaska. They were instructed to observe the agricultural conditions existing in places visited, the possibilities of further extension of arable land, and the native plants used for food and forage; to make collections of soils and of food and forage plants, and to determine as far as practicable what localities are suitable for experiments in agriculture and what kind of experiments seem immediately feasible and desirable. This commission started for Alaska about the 1st of June, and brief preliminary reports thus far received indicate that it is successfully prosecuting its work. It is definitely expected that a report of its findings can be prepared so as to be transmitted to Congress during its coming session. Through the courtesy of the honorable Secretary of the Interior and the Commissioner of Education, the services of Dr. Sheldon Jackson, superintendent of Government schools in Alaska, were secured to investigate the agricultural capabilities of the Yukon Valley. Dr. Jackson is to perform this service in connection with the annual inspection of the Alaska schools, in which he is now engaged, and his report may be expected at the same time as that of the commission.

Recent events have greatly augmented the importance of active measures to develop the agriculture of Alaska. The information recently received from unofficial sources, as well as that previously gathered by officers of the Government, seems to make it clear that it will be practicable to develop the agriculture of that region so that it may furnish food supplies and beasts of burden for a considerable population. The development of agriculture in this region, as elsewhere, can undoubtedly be greatly promoted by experimental inquiries conducted systematically under the supervision of expert officers. I would therefore urge that the appropriation for investigating the agricultural resources and capabilities of Alaska be continued and that provision be made for the carrying on of experiments in that region in case the official inquiries now in progress there seem to make this desirable.

Inasmuch as further surveys of the agricultural capabilities of Alaska will undoubtedly be desirable, and the active cooperation of this Department in the establishment of experimental inquiries in that region would undoubtedly secure the most prompt and efficient results, I recommend that Congress be asked to appropriate $15,000 which may be expended by the Secretary of Agriculture in continuing investigations upon the agricultural resources and capabilities of Alaska, in locating and maintaining agricultural experiment stations and experimental farms in said Territory, and in conducting such other investigations relating to the agriculture of said Territory as he may deem advisable, and that he be authorized to expend the sum thus appropriated, or any portion of it, for the employment of such assistants, clerks, and other persons as he may deem necessary; the purchase and rental of land; the erection and rental of buildings; traveling; the preparation, publication, and distribution of bulletins

and reports; the purchase and distribution of seeds and plants, and the payment of any other expenses which he may find essential in carrying on the aforesaid agricultural investigations.

Experience in the more recently settled portions of this country, as well as in the Dominion of Canada, has, in my judgment, clearly shown that the first attempts to promote the agriculture of a great and partially unexplored region like Alaska can be best conducted by the General Government. The work partakes largely of the character of an agricultural survey of the region, and the experimental inquiries at first undertaken should for the most part consist of attempts to determine what crops and agricultural industries are best adapted to particular regions. It is only after this preliminary work has been accomplished that it is desirable to establish regularly organized experiment stations such as are provided for in the act of Congress of March 2, 1887.

This Department, with its scientific divisions and its facilities for procuring and distributing seeds, plants, and other agricultural materials needed in a new region, can, for a certain period at least, render more efficient service than could be given by any experiment station organized under the local authorities, as in the case of the other States and Territories. Moreover, in a newly settled region like Alaska, where the population is rapidly shifting and the settler is confronted with almost innumerable difficulties in his earliest attempts to maintain himself through agriculture, it is exceedingly difficult to secure the proper organization and maintenance of experimental inquiries if these are left entirely to local boards of control.

After the Government has made its preliminary surveys and has determined in a general way in advance of the settlement of the country what kind of agriculture can be pursued, and the people of the region are informed regarding the scope and limitations of investigations in agriculture which experiment stations may properly undertake, it will undoubtedly be best to include Alaska with the other States and Territories as a recipient of the benefits conferred by the act of Congress of March 2, 1887. For the present, however, it is my firm belief that much more may be accomplished with a given amount of money by continuing agricultural investigations in Alaska under the immediate direction of the Secretary of Agriculture.

PUBLICATIONS OF THE OFFICE.

During the year the office issued 39 documents, aggregating 2,607 pages. These include 12 numbers of the Experiment Station Record with detailed index, 12 bulletins, 6 farmers' bulletins, 6 circulars, the annual report of the director, a report to Congress on the work and expenditures of the experiment stations, and an article for the Yearbook of the Department.

EXPERIMENT STATION RECORD.

The eighth volume of the Experiment Station Record comprises 1,210 pages, and contains abstracts of 340 bulletins and 62 annual reports of 53 experiment stations in the United States, 92 publications of the Department of Agriculture, and 702 reports of foreign investigations. The total number of pages in these publications is 38,552. The total number of articles abstracted is 1,565, classified as follows: Chemistry, 157; botany, 69; fermentation and bacteriology, 5; zoology,

10; meteorology, 54; air, water, and soils, 55; fertilizers, 103; field crops, 228; horticulture, 154; forestry, 11; seeds and weeds, 29; diseases of plants, 79; entomology, 126; foods and animal production, 177; veterinary science, 51; dairying, 139; technology, 4; agricultural engineering, 22; statistics, 92. Classified lists of articles, in some cases with brief abstracts, are also given in each number. The aggregate number of titles thus reported is 2,200.

Special articles were also published in the Record as follows: "The physiological rôle of water in plants" and "A review of publications on agricultural botany issued in France during 1896," by Edmond Gain, dean of the faculty of the University of Nancy (France); "The formation of fat in the animal body," by Selik Soskin, Ph. D.; "Dairy work at the experiment stations," by E. W. Allen, Ph. D., of this office; "The nitrogen-free extract of plants and feeding stuffs," by B. Tollens, Ph. D., director of the Agricultural-Chemical Laboratory of the University of Göttingen, Germany. There are condensed accounts of the proceedings of the thirteenth annual convention of the Association of Official Agricultural Chemists and the tenth annual convention of the Association of American Agricultural Colleges and Experiment Stations, prepared by W. H. Beal, of this office, and of the ninth annual convention of the Association of German Agricultural Experiment Stations, prepared by Oliver L. Fassig, of the Weather Bureau of this Department, who attended the convention for this purpose. The volume also contains a number of editorials on topics which may be of special interest to investigators in agricultural science, and under the head of "Notes" facts regarding the current work of the stations, changes in their working corps, and additions to their equipment, new legislation affecting their work, etc.

The plan of publishing in the Record accounts of methods of analysis, prepared by the abstract committee of the Association of Official Agricultural Chemists, has been continued. The assistant director of this office has acted as chairman of that committee. This particular field has been more thoroughly covered than in previous years.

The systematic abstracting of Russian reports of agricultural investigations has been undertaken in this volume for the first time, and it is hoped to make this feature of the Record more complete in the future. Arrangements have also been made to present a more complete review of the literature of veterinary science. Through changes in the personnel of the office it has been practical to extend the specialization of the work of the different editors, and to make the review of the literature of agricultural science more extensive than heretofore. At the same time increased efforts have been made to make the abstracts concise, and to confine them quite strictly to articles having an agricultural bearing. Every year brings an increase in the mass of reports of investigations in agricultural science issued in different countries, and the task of making a satisfactory review of all this material within reasonable limits grows more complex and difficult. Its importance is also enhanced as interest in such investigations increases in this country and the needs of our investigators and students are broadened.

TECHNICAL BULLETINS.

The Cotton Plant: Its History, Botany, Chemistry, Culture, Enemies, and Uses (Bulletin No. 33), including summaries of information on different topics relating to this plant considered in their agricultural

bearing. In this publication the effort was made to present a somewhat complete review of our present information regarding this important economic plant with a view to providing agricultural investigators with a basis for further investigations. It serves to show that comparatively few original investigations have as yet been made on the cotton plant, and thus points out the way for a large amount of useful work by the experiment stations located in the region where cotton is produced. In the preparation of this bulletin the office enjoyed the cooperation of officers of this Department and other experts especially well qualified to treat the different subdivisions of the subject. The chapters of the bulletin and their authors are as follows: Introduction, by Chas. W. Dabney, jr., Ph. D., Assistant Secretary of Agriculture; History and general statistics of cotton, by R. B. Handy, of this office; Botany of cotton, by W. H. Evans, Ph. D., of this office; Chemistry of cotton, by J. D. McBryde, chemist of the Tennessee Experiment Station, and W. H. Beal, of this office; Climatology and soils, by Milton Whitney, chief of the Division of Soils of this Department; The manuring of cotton, by H. C. White, Ph. D., president and professor of chemistry of the Georgia State College of Agriculture and Mechanic Arts and vice-director and chemist of the Georgia Experiment Station; Cultivated varieties of cotton, by S. M. Tracy, M. S., director of the Mississippi Agricultural Experiment Station; Culture of cotton, by Harry Hammond; Diseases of cotton, by George F. Atkinson, M. S., professor of botany in Cornell University; The insects which affect the cotton plant in the United States, by L. O. Howard, Ph. D., Entomologist of this Department; The handling and uses of cotton, by Harry Hammond; The feeding value of cotton-seed products, by B. W. Kilgore, assistant chemist at the North Carolina Experiment Station, and a Supplemental bibliography of cotton.

Notes on Irrigation in Connecticut and New Jersey (Bulletin No. 36), by C. S. Phelps, B. S., and Edward B. Voorhees, M. A., contains accounts of the practical application of irrigation to agriculture in Connecticut and New Jersey and the results of some experiments in this line conducted by the experiment stations in those States. The bulletin was intended to supplement the popular discussion of the principles and practice of irrigation in humid climates given in Farmers' Bulletin No. 46 and to show the problems needing further investigations by the experiment stations.

Organization Lists of Agricultural Experiment Stations and Institutions with Courses in Agriculture (Bulletin No. 39) contains a list of experiment stations in the United States, with their governing boards and working staffs; a list of agricultural schools and colleges in the United States, with courses of study and boards of instruction; a list of officers of the Association of American Agricultural Colleges and Experiment Stations and of the Association of Official Agricultural Chemists of the United States; a list of station publications received at this office during 1896; Federal legislation affecting agricultural colleges and experiment stations, and regulations and rulings [illegible] Federal [illegible] affecting the stations.

[illegible] seventh annual convention of the Association [illegible] American Agricultural Colleges and Experiment Stations, held at [illegible] November 10–12, 1896 (Bulletin No. 41), contains, [illegible] proceedings of the convention, papers, addresses, [illegible] students and investigators [illegible]

Cotton Culture in Egypt (Bulletin No. 42), by George P. Foaden, B. Sc., professor of agriculture, Tewfikieh College of Agriculture, Ghizeh, Egypt, contains information regarding the present status of cotton culture in Egypt, collated by a competent observer permanently located in that country. The bulletin also contains statistics of the exports of cotton from Egypt, compiled by Frank H. Hitchcock, Chief of the Section of Foreign Markets of this Department, which serve to show the growing importance of Egypt as a cotton-exporting country.

A brief statement regarding other bulletins issued in connection with the work in nutrition investigations may be found on page 136.

FARMERS' BULLETINS.

Fowls: Care and Feeding (Farmers' Bulletin No. 41), by G. C. Watson, B. Agr., M. S., professor of agriculture in Pennsylvania State College and agriculturist of the Pennsylvania Agricultural Experiment Station, contains practical information regarding the management of poultry by an author who has given much attention to careful experimenting in this line.

Commercial Fertilizers: Composition and Use (Farmers' Bulletin No. 44), by Edward B. Voorhees, M. A., director of the New Jersey Agricultural Experiment Stations and professor of agriculture in Rutgers College, furnishes such general information regarding commercial fertilizers as the farmer requires in order to enable him to purchase and use them economically.

Irrigation in Humid Climates (Farmers' Bulletin No. 46), by F. H. King, professor of agricultural physics in the College of Agriculture of the University of Wisconsin and physicist of the Wisconsin Agricultural Experiment Station, contains a summary of the results of practical experience in the use of water for irrigation in climates having considerable rainfall. Special mention is made of the observations of the author in various countries in Europe.

The Manuring of Cotton (Farmers' Bulletin No. 40) was condensed from an article on the same subject by H. C. White, Ph. D., in Bulletin No. 33, above mentioned.

Sheep Feeding (Farmers' Bulletin No. 49), by John A. Craig, professor of animal husbandry in the University of Wisconsin, is largely devoted to statements of the results of investigations by the experiment stations on this subject.

Experiment Station Work, I (Farmers' Bulletin No. 56), is the first number of a series of brief popular bulletins based upon the work of the agricultural experiment stations and includes articles on the following subjects: "Good *vs.* poor cows;" "Corn *vs.* wheat;" "Much *vs.* little protein;" "Forage crops for pigs;" "Robertson silage mixture;" "Alfalfa;" "Proportion of grain to straw;" "Phosphates as fertilizers;" "Harmful effects of muriate of potash;" "Studies in irrigation;" "Potato scab," and "Barnyard manure."

In this series of publications it is proposed to present such features of the progress of agricultural investigation on its practical side as will enable the farmer to take advantage of the work of the experiment stations in this and other countries, as far as he may be able to utilize it on his own farm. Without doubt it was the expectation of the friends of agricultural investigation who were most active in promoting the passage of the act of Congress of March 2, 1887, establishing the agricultural experiment stations, that whatever results of practical value were attained at any one station should be made

available to the farmers of the whole country. To do this properly and systematically has proved a much larger and more difficult task than was at first apparent.

When the Experiment Station Record was established it was thought that this would, to a large measure, satisfy whatever popular demand there might be for information regarding the work of all the stations. It soon became evident, however, that the needs of the investigators at the stations demanded that the scope of the Record should be greatly extended, and that its reviews of the literature of agricultural investigations should include a large mass of scientific material and abstracts of reports of progress of investigations which would be of no advantage to the farmer. The attempt to make the Record in any sense a popular publication was therefore abandoned, and it was developed in the direction of presenting a complete technical review of agricultural investigations throughout the world. Necessarily much time and effort were expended in ascertaining the sources of information of agricultural investigations carried on in foreign countries and in organizing a system for collecting this material and perfecting the abstracting. This, together with an increased amount of other work imposed upon the office, has hitherto made it impracticable to undertake a systematic popular review of station publications. One thing which also contributed to delay the undertaking of this task was the pressing need of such popular résumés of information on different subjects as has been presented in the general series of Farmers' Bulletins of the Department. In organizing this series and contributing to it, this office has contributed its full share of effort.

It is believed, however, that the time is now ripe for the development of its work in the direction of the regular and systematic presentation of popular résumés of the current work of the experiment stations. The difficulty of adequately meeting the popular needs in this direction can only be appreciated by those who have made a thorough study of the problems involved in the explanation of the methods and results of agricultural investigations to popular audiences. The effort will be made, however, to study the real needs and demands of farmers along this line, and to provide such material as will give them a clear view of the progress which the experiment stations are making in aiding agricultural practice.

PUBLICATIONS CONTEMPLATED AND IN PREPARATION.

Besides the abstracting of current literature of agricultural science, the office has hitherto undertaken the compilation of the accumulated literature of different subjects with a view to providing investigators and students an adequate basis for further investigations. It is believed that this work is of very great importance and that, as regards many subjects, it must be done, if at all, by governmental agencies. The literature of most of the subjects with which agricultural science deals is very widely scattered, and so pressing are the demands for immediate investigation of many subjects that the workers are too often compelled to undertake investigations without being thoroughly informed regarding what has already been done in the subjects on which they are working. In order to present a well-balanced review of the current literature of agricultural science, the workers in this office are compelled to give much attention to the examination of the older literature of different subjects; and as the mass of literature

increases from year to year it is more and more difficult to distinguish between the new and old in any given publication unless convenient summaries of information on that subject are at hand. It is hardly to be expected that private persons will undertake the preparation of such summaries, as the demand for them is not sufficiently extensive to make their publication remunerative. A considerable amount of such work can, however, be done by this office in connection with its other necessary work without very considerable expense. By so doing it is thought it can very efficiently promote the interests of original investigation in the Department, at the experiment stations, and elsewhere.

The Compilation of Analyses of American Feeding Stuffs (Bulletin No. 11), the Handbook of Experiment-Station Work (Bulletin No. 15), and the bulletin on the Cotton Plant (Bulletin No. 33) serve to show what has thus far been done in this direction and to indicate the usefulness of such work.

For some time past the office has been at work on a compilation of the results of investigations on the metabolism of man and the domestic animals, which was begun in connection with the work in nutrition investigations. The manuscript of this bulletin has been completed and it is now passing through the press. It includes accounts of over 3,600 investigations collated from widely scattered sources.

Considerable work has already been accomplished in collecting information regarding the maize plant, and it is hoped that ultimately it may be practical to issue a comprehensive résumé of information regarding this plant similar in character to the bulletin on the cotton plant.

More than four years have elapsed since the manuscript of the Handbook of Experiment-Station Work was put in form for the printer, and it is deemed very desirable that a revision of this publication shall be undertaken without delay.

It has not thus far been found feasible to publish the index of the new varieties of plants introduced by horticulturists which has been prepared by this office with the cooperation of the Division of Pomology. It is hoped, however, that means will be provided for bringing this index up to date and continuing it from year to year.

CARD INDEX.

Copy for 3,200 cards of the Index of Experiment-Station Literature has been prepared in this office and forwarded to the printer during the year. The number of index cards distributed has reached 13,000. The receipts from sales of this index during the past year have been $127.25. The work on this index is now proceeding more satisfactorily than ever before as regards the preparation of copy, the promptness of printing, and the regularity of distribution.

DISTRIBUTION OF PUBLICATIONS AND SEEDS.

Supervision of the mailing lists used in the distribution of publications of the Department to experiment stations and educational institutions has been continued by this office during the past year. The official mailing list of experiment-station officers has been furnished on demand to the experiment stations throughout the country for use in the distribution of their publications. This list is kept in type, and is corrected at frequent intervals.

This office took part in the distribution of sugar-beet seed made last spring by arranging with the experiment stations in different parts of the country to conduct cooperative field tests of the seeds sent out from the Department, to analyze samples of the beets, and to report the results for publication by the Department. The advice of experiment-station officers has also been sought regarding the needs of their several States in relation to the annual general distribution of seeds by the Department and the means for making this distribution more effective and useful.

BIBLIOGRAPHICAL WORK.

The publications of the agricultural colleges and experiment stations received during the year have been added to the library of the office and the work of cataloguing them has been continued. Duplicates of station publications have been sent to stations and station officers desiring to complete their files. A large number of exchanges of foreign publications containing reports of agricultural investigations has been received and transmitted to the Department library. The receipt in the library of several thousand numbers of periodicals has been brought to the attention of the editorial force engaged in the preparation of the experiment station record. A list of 1,450 works on agricultural subjects issued by different publishers during a period of about four years was collated and issued as Circular No. 31 of this office. Work on a supplementary list has been continued during the year. In this undertaking the office has enjoyed the cordial cooperation of the librarian of the Department, and it is hoped that it may hereafter be practicable to issue from time to time lists and notices of such works through the cooperation of the library and the editorial force of this office. Such information is greatly needed by our investigators, teachers, and students in agricultural science.

As members of a committee appointed by the Association of American Agricultural Colleges and Experiment Stations the librarian of the Department and the director of this office have taken part in the examination of lists of works on agriculture for the purpose of formulating a plan for preparing a general index of such literature. The plan proposed by the committee has been approved by the association and it is hoped that means will be provided to enable the librarian to compile and issue this index.

RELATIONS WITH AMERICAN INSTITUTIONS FOR AGRICULTURAL EDUCATION.

The intimate relations which the experiment stations sustain to the agricultural colleges bring this office into close contact with the colleges. In connection with their visits to the stations, representatives of the office have many opportunities for observing the educational work which the colleges are doing in behalf of agriculture. The financial and statistical reports of the colleges receiving appropriations under the act of August 30, 1890, which in accordance with the [illegible] regularly forwarded to the Secretary of Agriculture, have for [illegible] years been deposited in this office, the last reports received being for the fiscal year ending June 30, 1897. The activity of these institutions on agricultural lines is evidently increasing from year to year. More attention is being given to the development of agricultural courses [illegible] and pedagogical principles, and the need of adequate

equipment as regards buildings, apparatus, and illustrative material is more fully appreciated. The differentiation of the regular college courses from those of a special or elementary character is proceeding with increasing rapidity in recent years.

There is a constantly growing demand for the provision of instrumentalities by which agricultural instruction can be imparted to larger numbers of our agricultural population. The colleges of agriculture are already overburdened in their efforts to meet this demand through special and short courses, farmers' institute work, and home reading circles. At the University of Minnesota a secondary school of agriculture, maintained as distinct from the college of agriculture, is receiving hearty support and is attended by large numbers of students.

A movement to introduce what is termed "nature" teaching into the common schools of New York is attracting widespread attention. This work is being carried on under the leadership of the college of agriculture of Cornell University, which has been given a special appropriation by the State legislature for this purpose. Thus far the work has been chiefly confined to the rural schools, but there is already a demand that it shall be extended to the lower grades of schools in towns and cities. While the chief object of this movement is to secure the training of the powers of observation of young children through the study of natural objects, the attention of the teachers in the rural schools has been strongly called to the use which they may easily make of those natural objects, such as plants, insects, and birds, with which the farmer has to deal in the practice of his art. The instruction is thus naturally given an agricultural bent which can not fail to incline the students favorably toward agriculture, as well as to give them that elementary training in the use of their powers of observation which will be generally useful to them in after life.

One of the great national associations of educators has recently indorsed a plan for the betterment of the common schools which urges that agriculture receive due attention in connection with the courses of instruction given in such schools.

At the convention of the Association of American Agricultural Colleges and Experiment Stations, held at Washington last fall, an elaborate report of a committee on entrance requirements, courses of study, and degrees, defining the requirements for entrance to agricultural colleges and the general character of the course which should be pursued to entitle the student to a bachelor's degree, was adopted after full discussion.

The standing committee on methods of teaching agriculture, appointed by the same association, has continued its labors during the past year. The director of this office has acted as a member of this committee. The first and second reports of progress made by the committee have been issued as Circulars Nos. 32 and 37 of this office. This work, which is in line with that which is being done for other branches of study, will, it is believed, do much to improve the character of the agricultural instruction in our colleges and open the way for the settlement of difficult pedagogical problems involved in such instruction.

As a contribution to the movement in behalf of agricultural education the director of this office prepared an article on agricultural education and research in Belgium, which has been published in the Yearbook of the Department for 1896.

It is believed that it is clearly within the province of this Depart-

ment, under the organic act by which it was established, to exert itself actively in the promotion of those enterprises which tend to promote the general welfare of the farmer as well as to increase his material resources. It is hoped that a way may be opened in the future by which the Department may do much more than it has in the past to aid in broadening the intellectual horizon of the farmer and in filling his home life with those refining and ameliorating influences which will constitute the most powerful incentives to intelligent activity in the conduct of his business and to contentment with his situation apart from the crowded centers of population.

RELATIONS WITH FOREIGN INSTITUTIONS FOR AGRICULTURAL EDUCATION AND RESEARCH.

During the past year considerable progress has been made in securing more intimate relations with the institutions for agricultural education and research in foreign countries. The director of this office personally visited a considerable number of these institutions in Germany, France, Switzerland, Belgium, Holland, England, and Canada. He was everywhere most cordially received and was able to secure the active cooperation of the officers of these institutions in furnishing articles for the Experiment Station Record, exchanging publications, and giving such information as will be of great service to workers in similar lines in this country. For the first time a representative of this office attended the meeting of the Association of German Experiment Stations and made a report of its proceedings, which has since been published. Officers of experiment stations in this country, acting under instruction from this office, visited agricultural institutions in Denmark, Norway, Sweden, and Russia.

This office has recently been informed by Sir John Bennet Lawes, of Rothamsted, England, that he is about to send to the Department 26 sets (234 volumes) of the Memoirs of the Rothamsted Experimental Station, in which detailed accounts of the investigations carried on at that station for more than fifty years are given. These sets are in addition to 26 previously given by Sir John and are to be sent to those agricultural colleges and experiment stations which did not receive copies in the former distribution. The great generosity displayed in these gifts is deeply appreciated by the recipients, and without doubt these valuable works will long be available to our students and investigators in different parts of the country. Under that provision of the Lawes Trust by which a lecturer is to be sent to this country at frequent intervals at the expense of the Lawes fund to describe the results of the investigations at Rothamsted, Prof. Henry E. Armstrong, Ph. D., LL. D., F. R. S., a member of the Lawes Trust and an eminent professor of chemistry in the London Institute for the Advancement of Technical Education, is visiting this country, and has lectured [illegible] American Agricultural Colleges and Experi- [illegible] Stations [illegible]

[illegible] AND EXPERI- [illegible]

[illegible] was held at Wash- [illegible] delegates from this Depart- [illegible] Assis[illegible] the director of this office. [illegible] also took part in the delibera-

tions of the convention. The director of this office was reelected bibliographer of the association. The stenographic report of the proceedings was prepared under his supervision and has since been edited by him and the chairman of the executive committee of the association and issued as Bulletin No. 41.

The following resolutions relating to this Department and to the experiment stations were adopted:

Whereas the Committee on Agriculture and Forestry of the United States Senate has reported a bill to provide for a director in chief of scientific bureaus and investigations in the Department of Agriculture, with the recommendation that the same do pass; and

Whereas the work of the various agricultural colleges and experiment stations has brought those institutions into relations with the Department of Agriculture of such a character that any important change in the administration of the affairs of that Department must necessarily affect the success and welfare of the colleges and stations: Therefore be it

Resolved, By the Association of American Agricultural Colleges and Experiment Stations that the creation of the proposed office and the appointment thereto of a broadly educated scientific man, who shall hold office during good behavior, would be of the highest value to the cause of scientific agriculture in the continuity of purpose and harmonization of operations that should result from the labors and influence of such an officer.

(1) Inasmuch as a large amount of experiment-station work has been reported since the Handbook of Experiment Station Work was issued, this association would respectfully urge the honorable Secretary of Agriculture to arrange for the preparation of a revised edition of this useful publication by the Office of Experiment Stations at an early day.

(2) Inasmuch as a large part of the work of the United States Department of Agriculture is along lines kindred to those of the experiment stations, it is deemed by this association highly desirable that the revised edition of the handbook should include summaries of the work of the Department as well as of the stations.

(3) There is, in the judgment of this association, great need of a general index of the publications of the Department, and as the preparation of such an index would almost necessarily precede the making of summaries of Department publications for the handbook, it is hoped it will be practicable for the Department to undertake at once the preparation of this index.

The association appointed a committee of experts in seed testing to devise and adopt a standard form of seed-testing apparatus and methods of procedure for use in all American stations which shall hereafter publish seed tests. Mr. G. H. Hicks, of the Division of Botany of this Department, was appointed a member of this committee. On invitation of the honorable Secretary of Agriculture this committee held a meeting at Washington and formulated rules for seed testing, which were published as Circular No. 34 of this office, and were afterwards indorsed by the association. This action of the association, in cooperation with the Department, will undoubtedly do much to secure for the movement in favor of pure and good seeds the support and confidence of the agricultural public and the effective cooperation of honest and reliable seedsmen.

EXPERIMENT-STATION EXHIBIT AT THE PARIS EXPOSITION OF 1900.

In view of the fact that agricultural research is organized on a grander scale in this country than elsewhere, and that the system has been very largely developed during the period since the Paris Exposition of 1889, it would seem to be a matter of course that an exhibit showing the progress of the United States in this important direction should be made at the Paris Exposition of 1900. Such an exhibit, properly prepared and installed, would not only be creditable to this

country, but would also be of exceeding interest to the friends of agricultural progress in all lands. Through the publications of this Department and the stations much is already known abroad regarding the work of the experiment stations in this country, but there are also many misconceptions regarding this enterprise which an exhibit at that exposition, together with the conferences which will undoubtedly be held in connection therewith, would do much to remove. By this means the bonds of union with foreign institutions working in similar lines would be greatly strengthened, and the efforts now in progress for securing to our investigators and people the fruits of agricultural investigations abroad would be made much more effective.

At the recent convention of the Association of American Agricultural Colleges and Experiment Stations, held at Minneapolis, the desirability of making an exhibit of the methods and results of the work of the stations at Paris through the cooperative efforts of this Department and the stations, as was done at the Chicago Exposition, was earnestly discussed, and with great unanimity the association decided in favor of such an exhibit. A committee was appointed to confer with this Department, with instructions to undertake the preparation of a cooperative station exhibit at Paris in 1900, if suitable arrangements could be made with the Department to insure the success of the enterprise.

It is of course understood that only such general plans can now be made as may enable the Department to decide whether such an exhibit is advisable. Until the question of the appropriation for this Exposition, now pending before Congress, has been settled no definite plans can be drawn. There seems, however, to be little doubt that Congress will take favorable action in this matter and that the Department will have its share of the appropriation for the proper representation of the interests of American agriculture at the Paris Exposition. It is believed that the early consideration and settlement of preliminary questions regarding the character and conduct of an experiment-station exhibit would greatly facilitate the preparation of the exhibit in a satisfactory manner. Experience in connection with the Chicago Exposition showed that there are many difficulties in securing the prompt and intelligent cooperation of such a large body of widely scattered institutions as our experiment stations. Experts on this subject fully agree that no time should be lost if the American stations are to be properly represented at Paris in 1900.

CHANGES IN THE PERSONNEL OF THE OFFICE.

There has been an unusual number of changes in the personnel of the expert and editorial force of the office during the past year. Dr. [illegible] Test, who had charge of the work in horticulture, entomology, [illegible] veterinary science, resigned early in the year to devote himself to [illegible] study and practice of medicine. Mr. Loren P. Smith, who had [illegible] recently [illegible] noted to have charge of the work on field crops [illegible] competitive examination under the rules of the Civil Service Commission, was suddenly removed by death, and Mr. F. H. Hall, who was promoted to fill the position left vacant by the decease of Mr. Smith, was soon appointed editor and librarian of the New York State Experiment Station, as the result of a civil-service examination under the law [illegible] that state and the offer of a larger salary [illegible] appointment of new

officers some rearrangement in the direction of further specialization of work was deemed best. As the result of special civil-service examinations Dr. F. C. Kenyon was appointed to take charge of the work in entomology and veterinary science; Mr. R. A. Emerson, horticulture, and Mr. J. I. Schulte, field crops.

As the work of the office advances the loss of efficient and experienced officers is more severely felt. It is much to be deplored that the Department is in many cases unable to retain the services of such officers because of its inability to offer them adequate salaries. The increasing competition to secure the best specialists at institutions of education and research is steadily raising the rates of compensation for such services, and the Department is therefore increasingly put at a disadvantage if its salaries for similar services are lower than those outside. Owing to the fact that living expenses in Washington City are now necessarily governed by the conditions existing in all large cities, the salaries paid in many institutions located in smaller places are relatively much better than their face money value would indicate.

NUTRITION INVESTIGATIONS.

The appropriation for investigations "upon the nutritive value of various articles and commodities used for human food" was continued by Congress for the past fiscal year, and the supervision of the work performed under this appropriation remained in charge of this office. The services of Prof. W. O. Atwater as special agent in charge were also retained. In accordance with the terms of the law, the cooperation of the agricultural experiment stations has been sought as far as has been justified by their facilities and the requirements of their other work. Agricultural colleges and other educational institutions, as well as benevolent associations, have also continued to cooperate with the Department in this enterprise. The Department has thus secured the services of experts and laboratory and other facilities for its work on very economical terms. In almost every case the cooperating institution has contributed fully as large a share as the Department, if the terms of the arrangement be given a money valuation. The effort has been made to extend the benefits of this investigation to different sections of the country. In this way the attention of the public has been widely drawn to the work. At the present stage of inquiries regarding the food and nutrition of man, it is very desirable that the public interest in the matter should be aroused. One of the important practical results of such investigations should be that people generally will be awakened to the fact that it is greatly to their benefit, from both hygienic and pecuniary reasons, to give attention to the actual nutritive value of the food materials which they purchase and consume. When the importance of the matter is once realized, improvement in dietaries may be secured to a very considerable extent by those who possess only the most elementary knowledge regarding the scientific principles involved in the nutrition of man.

Besides the special investigations with the bomb and respiration calorimeters carried on at Middletown, Conn., under the immediate direction of the special agent in charge, studies of food supply and consumption, dietary studies, digestion experiments, and other investigations were carried on in Maine, at Orono, in cooperation with the Maine State College; in New York City in cooperation with the

Society for the Improvement of the Condition of the Poor; in New Jersey, at New Brunswick, in cooperation with the New Jersey State Experiment Station; in Pennsylvania, at Pittsburg, in cooperation with the Pennsylvania College; in Tennessee, at Knoxville, in cooperation with the University of Tennessee; in New Mexico, at Mesilla Park, in cooperation with the New Mexico Agricultural Experiment Station; in Minnesota, at St. Anthony Park, in cooperation with the Minnesota Agricultural Experiment Station; in Illinois, at Chicago, in cooperation with the Lewis Institute and the Hull House; in Indiana, at Lafayette, in cooperation with Purdue University; in Missouri, at Columbia, in cooperation with the Missouri Agricultural Experiment Station; in California, at Berkeley, in cooperation with the agricultural experiment station of the University of California; in Virginia, at Charlottesville, in cooperation with the University of Virginia, and at Hampton in cooperation with the Hampton Normal and Agricultural Institute.

Special attention has been given to studies of cereal products with particular reference to the effects of cooking and of different combinations of cereals and other food materials upon digestibility. Digestion experiments with various foods have been conducted in larger number than heretofore. The accumulated data in this line of work are still comparatively meager, and there is need of numerous experiments with a view to determining the actual digestibility of food materials alone and in combination.

The important investigations with the respiration calorimeter which have been in progress for some years under the immediate direction of the special agent in charge, in cooperation with Wesleyan University and the Storrs Experiment Station, have been continued. During the past year the apparatus for these investigations has been very largely perfected, and the respiration experiments made during the year with human subjects were more thorough and satisfactory than those previously conducted. When the data accumulated in these experiments have been calculated and put in form for publication, it is believed that it will be shown that an apparatus has been devised which will give results of high accuracy, not only as regards the measurement of the income and outgo of the carbon, nitrogen, and hydrogen, but also of heat and energy. When this end is attained, the apparatus can be readily duplicated for experiments on human subjects elsewhere and can easily be modified for use in similar experiments with animals. It is reasonable to expect that with the use of such an improved apparatus much additional light will be thrown on the difficult problems relating to the conversion of food into heat and energy in the body and the comparative nutritive value of different dietaries.

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(Bulletin No. 35), by Edward B. Voorhees, M. A., director of the New Jersey Agricultural Experiment Station and professor of agriculture at Rutgers College, contains an account of investigations carried on in cooperation with the New Jersey Experiment Station, which included a study of the composition and cost of bread, two baking experiments, the composition and cost of milk in cities in New Jersey, and a dietary study of a mechanic's family. The investigations on bread and milk reported in this bulletin serve to show the desirability of closer attention on the part of the purchaser to the securing of adequate return in nutritive value of the food purchased for the money expended. They also show the need of better standards by which to regulate the sale of these important foods.

Dietary Studies at the Maine State College in 1895 (Bulletin No. 37), by Whitman H. Jordan, M. S., director of the Maine Agricultural Experiment Station and professor of agriculture in the Maine State College, contains an account of experiments made to determine the relative expensiveness of different dietaries. The results were important as indicating that by attention to the nutritive values of the different articles of food, especially meat and milk, the cost of the dietary may be materially modified. These investigations were carried on in a college boarding house and are perhaps of especial interest to the managers of institutions where considerable numbers of people are fed on a uniform diet.

Dietary Studies with Reference to the Food of the Negro in Alabama in 1895 and 1896 (Bulletin No. 38), contains an account of studies conducted with the cooperation of the Tuskegee Normal and Industrial Institute and the Agricultural and Mechanical College of Alabama. A large amount of data, believed to be fairly representative of the kinds, amounts, and composition of the food materials which enter into the food of the colored population of the Southern States, is given and the deficiencies of their diet and the ways in which its hygienic and pecuniary economy may be improved are pointed out.

Dietary Studies in New Mexico in 1895 (Bulletin No. 40), by Arthur Goss, M. S., professor of chemistry in the New Mexico College of Agriculture and Mechanic Arts, contains a report of dietaries of three typical Mexican families and the composition of a considerable number of foods used in the dietaries of a large number of people in the southwestern portion of the United States.

The following publications are in press:

Losses in Boiling Vegetables and the Composition and Digestibility of Potatoes, and Eggs (Bulletin No. 43), by H. Snyder, Almah J. Frisby, and A. P. Bryant, contains an account of investigations carried on in cooperation with the Minnesota station and elsewhere with special reference to the effects of cooking and upon the nutritive value of potatoes and the comparative digestibility of potatoes and eggs.

Report of Preliminary Investigations on the Metabolism of Nitrogen (Bulletin No. 44), by Prof. W. O. Atwater, C. D. Woods, and F. G. Benedict, contains an account of investigations made with the respiration calorimeter above referred to (p. 136). This is the first detailed account of these investigations, which have already attracted wide attention.

The following bulletins have also been completed in manuscript: The detailed compilation of analyses of American food materials; and a report on dietary studies among people in the congested industrial districts of New York City during 1895 and 1896.

A number of other reports have been received and are being put in form for publication.

CONTINUANCE OF THE INVESTIGATIONS.

Congress having provided for the continuance of the nutrition investigations during the present year, arrangements have been made for carrying them on in accordance with the general plan hitherto followed. The investigations will be conducted in a number of the same places as last year, and the experience which the workers have acquired in this particular line of research should enable them to secure even better results than previously.

As these investigations have developed it has become apparent that some further definition of their limitations should be made. A considerable amount of the information thus far published had already been accumulated by agencies outside the Department before the Federal funds were available for this purpose. For example, as a basis for dietary and other nutrition studies it was necessary at the outset to compile tables of analyses of food materials, many of which had been made by the Division of Chemistry of this Department and by the experiment stations. These compilations have been supplemented as the investigations have proceeded by analyses made in connection with the dietary studies or with a view to supplying the deficiencies in our information regarding the composition of particular food materials. The point has now been reached when a sufficient number of analyses have accumulated for all ordinary purposes connected with nutrition investigations, and work on this line will therefore be discontinued, except as far as it may be necessary in connection with the dietary and digestion studies. Many questions regarding the methods of analysis and the chemical constituents of foods still remain to be solved. A few studies in this direction have been made in connection with the nutrition investigations, but as this is in itself a large field of investigation and is wholly chemical in its nature, it has been decided to exclude work of this kind from these investigations.

Systematic investigations on the nutrition of man are of so comparatively recent a date that the scope of the science of human nutrition has not yet been definitely determined. There is, however, a large number of problems the solution of which involves the application of the principles of physiology (i. e., the physics and chemistry of the human organism), which, without doubt, are within the domain of the science of nutrition. Questions regarding the food supply and consumption of people of different occupations and the pecuniary economy of different kinds of dietaries are by the terms of the law clearly within the province of the nutrition investigations carried on by this Department. For the current fiscal year, therefore, these investigations will be confined to studies of food supply and consumption, dietary studies (nutritive value and cost of different dietaries), digestion experiments, the effects of cooking on the nutritive value and digestibility of food, and calorimeter investigations. It is believed that along these lines there is need of the accumulation of a large amount of data by means of which the principles necessary to establish a rational basis for the nutrition of man may be established, and useful practical suggestions may be made for improving the dietaries of different classes of people from both hygienic and pecuniary standpoints.

There is already a large amount of popular interest in questions [illegible] human nutrition. Elementary instruction in physiology and

cooking is now quite generally given in the public schools. Cooking schools and departments of domestic science are already established in many places and their number is rapidly increasing. Such investigations as the Department is conducting will gradually furnish a scientific basis for such instruction, which is greatly needed. The Department is already in communication with numerous educational institutions throughout the country which have received its publications on these subjects and are seeking further information. The questions involved in those investigations also have an important bearing on the care and treatment of invalids, although it is not intended to undertake investigations with any but healthy subjects. No one knows better than the well-educated physician how slender is the basis of correctly ascertained facts on which theories of the digestibility of foods and other matters regarding the effects of foods on the human organism are based.

Moreover, investigations on human nutrition have an important relation to those which the experiment stations are conducting on the nutrition of domestic animals. For example, the apparatus (i. e., the respiration calorimeter) for the accurate determination of the income and outgo of the chemical elements of food and air and of the heat and energy resulting from the consumption of food when perfected may be readily adapted for use in experiments with animals. Thus far the scientific experiments on the nutrition of animals have been for the most part carried on in foreign countries. There is great need of thorough investigations in this line in this country, and it is hoped that one result of the nutrition investigations conducted by this Department will be to make it possible for our experiment stations to carry on more accurate and thorough investigations on the nutrition of domestic animals than have been undertaken elsewhere.

REPORT OF THE CHIEF OF THE DIVISION OF FORESTRY.

U. S. DEPARTMENT OF AGRICULTURE,
DIVISION OF FORESTRY,
Washington, D. C., August 31, 1897.

SIR: I submit herewith my report of the work of the division for the fiscal year ending June 30, 1897.

Respectfully, yours,

B. E. FERNOW, *Chief.*

Hon. JAMES WILSON, *Secretary.*

WORK OF THE YEAR.

The appropriations made for the fiscal year ending June 30, 1897, for the work of the Division of Forestry amounted to $8,520 for the statutory roll of employees and $20,000 for the general fund "to enable the Secretary of Agriculture to experiment and continue an investigation and report upon the subject of forestry and timbers, for traveling and other necessary expenses in the investigation, and for the collection and distribution of valuable economic forest-tree seeds and plants." Of this latter sum a very small balance remains unexpended.

CHIEF LINES OF INVESTIGATION.

The principal lines of experimentation have been three: (*a*) The experiments in tree planting in the plains; (*b*) timber physics; (*c*) biological investigations.

TREE-PLANTING EXPERIMENTS.

In the tree-planting experiments five stations, in addition to those ready established, were authorized, viz: College Station, Tex.; Still- ıter, Okla.; Logan, Utah; Crookston, Minn., and Grand Rapids, All ese stations are located on the experimental farms of colleges. In addition to 28 acres planted to trees in ·ture, six conifer nurseries have been established and a · of nursery stock has been purchased for future plant- ı ıtal plantings have in the main been very suc- much favorable attention from the people cn they are designed to benefit. The total antations at all stations is 59½ acres.

work during the fiscal year amounted to nount $675 was used in a cooperative range of hardiness of trees, and $3,200 nursery stock for future plantings, leav- stock set in permanent plantations, for

TIMBER PHYSICS.

The investigations heretofore conducted under the name of "timber physics," being an inquiry into the characteristics of economic species of timber which have bearing upon their use in mechanics and the arts, have been very considerably reduced in deference to the wishes of ex-Secretary Morton and yourself.

The expenditure in connection with this work for the year amounted to $1,166.15. Messrs. Neely and Stück spent three months at the laboratory in St. Louis working up data of tests previously made by Professor Johnson. Late in the year the test laboratory of the Southern Railway, in Washington, D. C., was rented, and the unfinished work necessary for the completion of such species as are now in course of investigation will be done here, except the testing of large beams, which will be done at St. Louis, the laboratory here not having facilities for such testing.

As I have pointed out repeatedly, in this line of investigation the value of the data depends largely upon their numerical quantity. A few tests and even a few hundred tests are valueless and unable to give a reliable statement of the average strength of the wood, because of the variableness of the material. Hence much of the data accumulated will remain valueless until a sufficient number of tests is added for those species for which only a small number of tests have so far been made. Besides, many of our most important timbers are still unknown as regards their quality. Especially is this the case with the Pacific Coast timbers, which will presently have to be used by the Eastern wood consumers, when the home supply begins to wane. This ignorance leads to wastefulness, and it is the duty of the Government to furnish the reliable information which alone can stop this waste.

These investigations are not only to determine the mechanical strength of our woods, although this has been the first object, but also their other properties which make them serviceable to the wood worker for the many purposes for which wood is used. A knowledge of the nature of the forest crop, of its quality and applicability to the arts, and of its dependence on soil and climate where grown is the final object of this line of work.

The only hope which we have to lengthen out our supplies of home-grown forest materials lies in a more conservative and economical use of the same.

At present not only is the logging done wastefully, but the woods are misapplied and uneconomically used on account of the prevalent ignorance of their true value.

There is no other Government agency equipped to carry on these investigations, which are as germane to forestry as the investigations into the chemistry of food crops or the investigation into the physics of soils and into the relation of soil and crop is to agriculture, and hence should be carried on by the Division of Forestry. Moreover, private endeavor is for various reasons unable to cope with the problem.

I recommend, therefore, that if the present general appropriations [illegible] Division of Forestry are not deemed sufficient or are not to be [illegible] so as to bring these investigations to a desirable conclusion, a special appropriation for the purpose be asked for as proposed by the bill presented in the House and Senate of the last Congress (H. R. No. [illegible]19 and S. No. [illegible]) and strongly recommended by your predecessor.

In connection with this line of work and with the object of promot- [illegible] national application of timber in the various indus-

tries, a report on the use of wood in mines was prepared by Mr. John Birkinbine, C. E., late president of the American Institute of Mining Engineers. It is proposed to secure similar reports by experts in other woodworking and wood-consuming industries.

BIOLOGICAL INQUIRY.

In the line of biological inquiry, which has for its purpose the determination of the life history of our principal tree species, including their rate of growth, characteristics at various periods of development, conditions affecting development, possibilities of protection, and similar practical aims, the work of the year has been fruitful.

An investigation into the development of white pine in the forests of Pennsylvania, Wisconsin, and Minnesota, resulting in the analysis of 675 individual trees grown under varying conditions, and 60 acre yield measurements, and a study of white cedar and of cypress, with observations on the forests of Tennessee, were made by various members of the division force, and the data thus obtained in the field have been prepared for the press.

In addition to these studies the division cooperated with the Department of the Interior in an investigation of the standing timber on the Red Lake Indian Reservation in Minnesota, which resulted in a revision and increase of estimates heretofore made by the agents of that Department.

The expenditures connected with biological work were almost exclusively for traveling, the total authorizations for the purpose amounting to $2,225, the expenditures being considerably less.

INVESTIGATIONS OF FOREST CONDITIONS.

The writer undertook in the summer of 1896 a more or less comprehensive reconnoissance survey of the forest conditions of Arizona and their relation to the cultural development of the Territory. The investigation was made at the request of a public-spirited citizen, Mr. D. M. Riordan, of Flagstaff, who generously assisted in the same, with a view of obtaining a basis for the formulation of a rational forest policy to be incorporated in the constitution of the coming State.

The time at disposal was not sufficient to complete the survey. To make a satisfactory comprehensive report a second visit would be necessary. The results of the first visit were, therefore, only utilized in the form of a popular lecture before a joint meeting of the American Forestry Association and National Geographic Society, published in part in the magazine of the latter society.

TIMBER TREES FOR THE ARID REGIONS.

In addition to this study of our own economic species, at your suggestion a beginning has been made in the investigation of the timber trees of the arid regions of other countries, with a view to securing such as may give promise of succeeding in the plains for trial here.

Dr. Edward Palmer, a botanical collector of note, has been commissioned to secure seeds of trees of economic importance from the dry regions of the Mexican plateau, which will be thoroughly tested in our Southwestern States and Territories. Mr. David Fairchild was requested to aid the division in a similar way by making a survey of the arid regions of Australia, in which continent he was traveling, but unfortunately the letter bearing his commission did not reach him until after his return to America.

Prof. N. E. Hansen, a special agent of the Department, who is now collecting seeds in eastern Europe and Siberia, will endeavor to secure promising forest-tree species for the experiments of this division.

PUBLICATIONS.

The publications of the division during the year include two bulletins, five circulars, and Senate Document No. 40, a review of the white pine timber supplies, prepared for your signature in compliance with a request of the Senate. Two articles were also furnished for the Yearbook.

The following bulletins and circulars are expected to be brought to completion and publication during the coming year: White Pine Monograph; Growth Tables of White Pine and Methods of Rate of Growth Measurement; Oregon Forests and Timber Trees; Forest Conditions of Wisconsin; Check-list of Names of Trees; Washington Trees; Distribution of Moisture in Green and Dry Timber; Influence of Size on Strength; Use of Wood in Charcoal Making and in Mines; Dry Kilns—Principles and Practice; Tree-planting in Forestless Regions.

PERSONNEL.

The personnel of the division has been but little changed during the year, the force now including, besides the chief and assistant chief, 1 dendrologist, 1 timber expert, 2 computers, 1 field agent, comprising what may be called the scientific staff, with 5 clerks and a messenger.

CORRESPONDENCE.

The correspondence of the division continues to increase, and covers a very wide range, requests for information on all subjects connected with tree species, timber statistics and tree planting, care and management, being received daily.

PROPAGANDA.

The division is still called upon from time to time to assist in the propaganda for better forestry methods and in the promotion of forestry education. In this connection the writer delivered a series of 12 lectures before the school of economics in the State University of Wisconsin, over 100 students attending, the lectures being designed to give students of political economy an idea of the position of forests and forestry in the national household.

Other lectures were given before the Ladies' Natural History Club of Milwaukee, the Home Congress at Boston, the New Jersey Forestry Association at Trenton and Plainfield, and at other occasions.

To assist in a worthy attempt to make a proper selection and use of plant material in the parks and streets of Savannah, Ga., although the subject is not exactly germane to the work of the division, Mr. Sudworth was detailed to assist the tree and park commission of that city, the commission paying expenses, for the purpose of making a report on the arborescent flo[illegible] surrounding district and its applicability for park p[illegible]

[illegible] requests fr[illegible] legislatures and others [illegible] legislation have been re[illegible] taken by the division in [illegible] legislation which resulted in the [illegible] of [illegible] Department of the Interior for [illegible] forest reservation [illegible] timber lands

Also, in the line of propaganda the division participated in the display made by the Department at the Nashville Centennial Exposition. The space being limited, it was mostly devoted to an exhibit of the varied forest flora of the South, a monographic display of the leading lumber trees of the South, and the instructive models prepared for the Atlanta Exposition, showing the influence of erosion on farms due to deforestation, from which the Southern States suffer especially.

RECOMMENDATIONS.

The present statutory roll is unsatisfactory, as is evidenced by the necessity which would seem to have appeared of transferring clerks to the lump fund appropriation in order to increase their salaries.

The absence of latitude to make reasonable increases of salary for length of service or increased efficiency, which a continuously stable statutory roll brings with it, has proved itself most objectionable.

A range of salaries for given positions, to be accorded at the discretion of the Secretary, would improve the service.

Believing, furthermore, with your predecessor, as expressed in the Secretary's report for 1896, that the scientific work in the Department is greatly underpaid, while the clerical work in proportion is paid fully up to its value, I would recommend, provided the statutory roll is adhered to, the following readjustment: Chief, $3,000; assistant chief, $2,500; indexer and general clerk, $1,400; stenographer and typewriter, $1,200; copyist typewriter, $1,000; herbarium clerk, $840; messenger, $480. Total, $10,420.

In order further to increase the efficiency of the division, I would recommend the addition of three scientific workers to the staff—a superintendent of the tree-planting experiments, an expert in vegetable anatomy, and a specialist to investigate and secure for trial promising trees from other lands. The tree-planting experiments should be extended not only in the area of the existing plantations, but in number, so as to fairly include all conditions to be met with throughout the western plains. Heretofore this work has been under the direct oversight of the assistant chief, but it is now assuming proportions which demand the entire attention of one man.

If the work of investigating the life history of our economic species is to be continued, and I can think of nothing of greater importance to the forest interests of the country, our timber expert should have the assistance of a trained vegetable anatomist. With two such men this work could not only be made much more effective, but a preliminary canvass of forestry conditions, recommended in the last annual report of this division, could be begun and methods for this important work could be evolved.

The work of collecting and importing foreign species, especially such as promise adaptation to our dry regions, should be made exhaustive, and for this purpose a man of peculiar qualifications is necessary. He should be not only a botanist and linguist, but he should be familiar with the practical needs of the West, and should have good business ability.

If the timber physics investigations are to be abandoned I would recommend that the two computers and one clerk now engaged in that work be dismissed, and the saving thus effected will provide for the salaries of at least two of the additional assistants needed.

The work of the division is capable of contraction or expansion according to the importance which is attributed to the forestry

interests of the country. In the opinion of the writer, a future generation will justly charge the present generation with criminal neglect of the subject.

Our present forest industries represent an annual product valued at over $1,000,000,000, yet these industries find no care in the Government beyond the small pittance of appropriations which has been made to the Division of Forestry.

Moreover, it is becoming more and more apparent that the future of our lumber supplies will depend more on the action taken by governments, State and Federal, than on individual action, since forest production involves such long periods of time that only permanent corporations such as the State can profitably engage in it. Hence, a much more serious consideration should be given to the subject than has been done so far.

In the first place, we should know the condition of our present supplies. An expenditure of $300,000 for this knowledge will not be misplaced, for it would at once take the question of existing and prospective supplies out of range of speculation and give a basis for all further measures and appropriations to secure a sufficient future supply.

The knowledge of the actual condition of supplies and their immediate future will also place the lumber manufacturers on their guard in time and undoubtedly induce more careful methods of logging and using the virgin supplies.

Correct knowledge of the properties of our timbers, their strength and other working qualities, would also serve to economize our present supplies and enable the coming forest grower to select his planting material with more circumspection. I recommend, therefore, most strongly, that the timber investigations be not abandoned, but be brought as fast as possible to a reasonable conclusion.

With the methods developed in the division it is believed that an expenditure of less than $50,000 will give us this most needful knowledge, which is immediately applicable to the practice and which the practitioners are anxiously looking for.

The biological knowledge and the experiences from forest-planting experiments, which are desirable when forest production or sylviculture will be more generally practiced, can be gradually accumulated and the slow progress in that direction is not reprehensible. Yet an annual expenditure of not less than $10,000 to $15,000 should alone be considered adequate and remove our present efforts from the deserved charge of picayunishness.

I recommend, therefore, that an increase of appropriations to $50,000 be submitted to Congress for the purpose of merely expanding adequately the lines of work so far inaugurated.

The authorization by Congress for the inauguration of a system of [illegible]tection and management of the national forest reservations nat[illegible] [illegible]ggests the possibility of the transfer of the reservations to [illegible] of this division, and I would respectfully suggest that such a [illegible]o be brought about by Congressional action, would not only [illegible] the forestry interests [illegible] under one administra[illegible] but would tend t[illegible] [illegible]nportant purpose of [illegible]ons, their use a[illegible] supply for the irrigation of the [illegible] lands of the [illegible] they are situated.

REPORT OF THE POMOLOGIST.

U. S. DEPARTMENT OF AGRICULTURE,
DIVISION OF POMOLOGY,
Washington, D. C., August 28, 1897.

SIR: I have the honor to submit herewith a report of the operations of the Division of Pomology for the year ending June 30, 1897, together with an outline of work for the current year and estimates for the ensuing year. Owing to the fact that my appointment as Pomologist took effect after the close of the fiscal year, that portion of the report covering the past year's work was prepared at my request by the Assistant Pomologist, Mr. W. A. Taylor.

Very respectfully,

G. B. BRACKETT, *Pomologist.*

Hon. JAMES WILSON, *Secretary.*

WORK OF THE YEAR.

The regular office work of the division has varied little from that of former years. It has consisted largely of correspondence with fruit growers, nurserymen, and others on matters relating to the adaptability of varieties to various portions of the country; methods of propagating, planting, pruning, and cultivating fruit trees and plants and of marketing the products thereof, together with answering such miscellaneous inquiries relating to the fruit industry in this and foreign countries as are received from time to time.

The disposition of this correspondence with the force of the division as now constituted consumes a large portion of the available working time of the Pomologist or his assistant, and encroaches upon the work of original investigation which it is desirable and highly important to pursue.

It is believed, however, that much benefit to the fruit-growing interests of the country results from the interchange of experience that grows out of such correspondence and that provision for its continuance and development without encroaching upon the more important work of original investigation should be provided.

EXAMINATION AND IDENTIFICATION OF SPECIMENS.

The receipts of specimen fruits of old varieties for identification and of seedlings for examination with a view to determining their probable value in comparison with varieties already named and disseminated has been large, though somewhat smaller than during the preceding year.

As a result of the investigation of specimen fruits received, more than 550 descriptions have been added to the files, while 175 water-

color paintings and about 200 wax models have been added to the already large collection. More than 100 photographic negatives comprising specimen fruits, methods of propagation, typical trees, and orchard scenes have been made during the year.

DISTRIBUTION OF TREES, SCIONS, CUTTINGS, PLANTS, AND SEEDS.

About 750 lots of trees, scions, cuttings, plants, and seeds of fruit-bearing varieties and species have been sent to experimenters during the year. A total of nearly 250 choice varieties, representing 25 species, have been distributed in this way.

FIGS.

In order that their adaptability to cultivation in the warmer portions of the country may be determined, collections of fig cuttings containing from 50 to 68 varieties each, derived from the scions and cuttings obtained from the Royal Horticultural Society of England in 1894, were placed at the experiment stations in Alabama, California, Florida, Georgia, Louisiana, Mississippi, North Carolina, and Texas, and with private experimenters in Illinois and Utah. Smaller collections were placed with a number of individual experimenters, mostly in the Gulf States. It is intended that these experiment-station collections shall be maintained in their entirety for a sufficient time to give the varieties a thorough test and that they shall be sources from which authentic stock of the more valuable varieties may be obtained in future by growers in the several regions.

CITRON.

Small trees of the variety of citron designated as "Corsican," derived from cuttings secured at Ajaccio, Corsica, in 1894, as the result of an investigation by a representative of this Department, were placed with more than 100 growers of citrus fruits, mainly in Florida and California. As a few trees derived from the same importation are bearing fruit this season, it is hoped that the value of the variety for planting in this country will soon be determined. It is believed to be the best type of that fruit known to commerce, and that its successful introduction here will lead to a considerable production of the article now largely imported from Europe, either as preserved citron or as citron in brine for preserving in this country.

CHINESE PERSIMMON.

About 350 seedling trees of Chinese persimmon, grown from seeds obtained through the United States minister at Peking in 1895, were distributed in small lots to experimenters in the sections where the native persimmon is found, and, for the purpose of testing hardiness and adaptability, to a few localities elsewhere.

As noted in the report of the Pomologist for 1895, the fruits from which these seeds were taken are reported to have been of large size, 8 to 12 inches in circumference, and of superior quality. The few seedling trees of this lot which were planted upon the Department [illegible] n Washington have endured the past two winters without [illegible] They are apparently quite distinct in their wood and leaf [illegible] the type [illegible] it imported some years ago from [illegible] consider[illegible] the subtropical portions of the United [illegible]

COMPARISON OF METHODS OF ROOT GRAFTING.

The nursery period of the first comparative test of methods of root grafting the apple was completed during the year. In this test scions of each of 25 varieties of apple received from Hungary in the spring of 1895 were used. These were root grafted upon apple seedlings by three methods, designated as "whole root," "top cut" and "bottom cut," and planted in consecutive order, by varieties, in a plot of ground where they could be given ordinary nursery treatment for two years. At the end of this time the trees were taken up with special care to insure the preservation of all the larger and more important roots. They were then carefully graded and counted to determine the relative percentages of marketable and unmarketable trees, as estimated by nurserymen. At the same time photographs were made to record observed differences in size and habit of root growth, due to the different methods of propagation. A full account of the experiment will be found in the forthcoming report of the Pomologist for 1896.

In accordance with the plan outlined in the report for 1895 the trees resulting from this experiment were divided into sets, each containing a number of varieties of trees propagated by each of the three methods. As far as possible the trees of each set were of uniform grade and size. These sets were placed at experiment stations for planting in orchard where they can be under the care of skilled observers with a view to determine the relative vigor and durability of the trees resulting from the different methods.

Such sets of varieties were placed at the experiment stations of Alabama, Arkansas, California, Colorado, Connecticut, Idaho, Indiana, Maine, Massachusetts, Maryland, Missouri, Nebraska, Nevada, Oregon, Pennsylvania, South Dakota, Tennessee, West Virginia, and Wisconsin. The horticulturists of these stations have agreed to cooperate in the experiment. At the same time the value of the varieties represented in the collection, all of which are supposed to be new to this country, will be determined by these experimenters.

The remainder of the trees resulting from the test were placed with private experimenters in different States, a careful record of the grade and method of propagation of each tree sent out being made and marked upon the label for the information of the planter.

APPLE VARIETIES FROM NEW ZEALAND.

In June, 1897, scions of 18 varieties of apples of New Zealand and Australian origin were received through the kindness of Mr. John C. Blackmore, pomologist of the department of agriculture of New Zealand. As not more than one or two of these were known to have been fruited in this country it was decided that they should be given a wide distribution. Though they were received after apple trees were in full leaf in all parts of the country they were successfully budded and grafted by a number of growers who received them, and it is hoped that the entire collection will soon be brought into bearing in this country.

ROUGH LEMON SEEDS.

As the Bahia or Washington navel orange, which has been found to be unproductive when budded upon sweet seedling or sour orange stocks in Florida, is reported to be sufficiently productive when worked upon the "Florida rough" or "French" lemon, a small quantity of

seeds of the "rough lemon" of Jamaica, a closely allied form of citrus, which is highly prized in that island as a stock for orange trees, was secured and distributed to growers in the citrus districts for experimental planting and budding.

The seeds were obtained through the kindness of Mr. William Fawcett, director of the Government botanical gardens at Kingston, Jamaica.

DOWNING'S FRUITS AND FRUIT TREES OF AMERICA.

Through the generosity of Mr. J. R. Hawkins, of Mountainville, N. Y., the division library has received the copies of Downing's Fruits and Fruit Trees of America used by the late Charles Downing up to the time of his death. These volumes contain corrections and supplemental notes on varieties made by the author during the later years of his life. As many of them are based upon observations made subsequent to the last edition of the work they are of much value to the student of American fruits.

As relics possessing historical interest, Mr. Hawkins also presented to the division the budding knife and garden trowel long used by Mr. Downing.

EXHIBIT AT TENNESSEE CENTENNIAL EXPOSITION.

As a means of spreading information on varieties of fruit suited to cultivation in the South, the exhibit of this division at the Tennessee Centennial Exposition was devoted chiefly to collections of models, paintings, and descriptions of varieties known to succeed south of the Ohio and Potomac rivers.

A special exhibit calling attention to the pineapple industry in Florida consisted of bromide enlargements of photographic views of pineapple field and marketing scenes, surmounting a glass case in which were successively shown fruiting plants of different varieties of the pineapple shipped from Florida for that purpose.

ADDRESSES MADE AND PUBLICATIONS ISSUED.

Papers and addresses were delivered by the Pomologist or the Assistant Pomologist at meetings of horticultural societies or farmers' institutes in Delaware, Maryland, Pennsylvania, and Ohio. A bulletin on Fig Culture, containing articles on "Edible figs; their culture and curing," by Dr. Gustav Eisen, and "Fig culture in the Gulf States," by Frank S. Earle, was issued during the year. The annual report of the Pomologist for 1895 was published, and a reprint edition of 1,000 copies of the report on Nut Culture in the United States was issued.

[illegible] CATALOGUE OF FRUIT VARIETIES.

[illegible] descriptive catalogue of fruits described [illegible] pomological works published in the United States has [illegible] T. T. Lyon, of Michigan, special agent of [illegible] fulness of this as a reference catalogue [illegible] of the completed portion of it dur- [illegible] at [illegible] revised Catalogue of Fruits of the Ameri- [illegible] Pomological Socie[illegible] the hands of the printer, to [illegible] bulletin [illegible]

OUTLINE OF CURRENT WORK.

In addition to the current work, an effort is being made to considerably enlarge the varietal herbarium of the division, which, when properly installed, will constitute an important adjunct in the work of identification and classification of varieties.

The nursery period of a second comparative test of the three methods of root-grafting, already alluded to, will be concluded. In this test standard varieties of American origin are used.

Renewed efforts to secure authentic stock of "Jordan" almond will be made.

It is intended that a beginning shall be made in the mapping of fruit districts, as outlined in the report for 1895.

No provision has yet been made for furnishing the State experiment stations with duplicate models of fruits in the manner recommended in the report of last year.

Certain lines of field investigation, which are of fundamental importance to American pomology, can not at present be taken up for lack of the appropriations necessary to prosecute them to a definite conclusion.

PLANS FOR THE ENSUING YEAR.

Besides carrying forward the investigations already under way and recommended, it is desirable that a systematic effort be made to introduce a large number of species of trees and plants from foreign countries which have not heretofore reached the United States.

A hasty preliminary examination reveals at least seventy species which are valued for their fruits in the countries where they are indigenous, covering a wide range of climatic conditions outside the tropics, and therefore worthy of introduction in the United States. In addition to these there are many allied species not valued for their fruit which are so closely allied to those already grown here as to warrant a thorough test of them as stocks. This should be done with a view to discovering some that will be suitable to propagate our choice improved varieties upon, many of which lack sufficient vigor or resistance to the somewhat unfavorable conditions of soil and vicissitudes of climate which exist in portions of the United States otherwise adapted to fruit production.

In order that the work already under way may be carried forward to completion and the proposed new work be taken up I would respectfully recommend that the estimates submitted for the ensuing fiscal year include the transfer of two clerks, at $1,400 per year each, now on the fund for pomological investigation, to the statutory roll of the division.

REPORT OF THE CHIEF OF THE DIVISION OF SOILS.

U. S. DEPARTMENT OF AGRICULTURE,
DIVISION OF SOILS,
Washington, D. C., July 28, 1897.

SIR: I have the honor to submit herewith a report upon the work of the Division of Soils for the fiscal year ending June 30, 1897.

Respectfully,

MILTON WHITNEY, *Chief.*

Hon. JAMES WILSON, *Secretary.*

WORK OF THE YEAR.

PRINCIPAL LINES OF INVESTIGATION.

The most important lines of work carried on during the past year have been an investigation of the soils of Florida; a continuation of the investigation of the principal tobacco soils of the United States; the perfection of the electrical method of determining the moisture, temperature, and salt content of soils; the study of the moisture content of a number of the important soil formations of the country, and a continuation of the investigations of the physical properties of soils and the devising of methods for the practical study of soil conditions.

A bulletin is in course of preparation on the preliminary study of the soils of Florida, particularly those adapted to tobacco, truck, and pineapples. A large amount of field work was done in Florida in the early spring and a great many soil samples collected there that have since been examined to determine their physical texture, and a few chemical analyses have been made by the Division of Chemistry to throw light upon some of the problems presented. Records have also been kept of the amount and daily fluctuation of the moisture in typical hammock, high pine, and scrub land of the State during the season, and the results throw an important light upon the agricultural value of the different soil formations of the State and the local distribution of the native vegetation.

The field work has been practically completed, and the laboratory work is about finished on the special study that has been made of the tobacco soils of the United States. A bulletin is in preparation giving the result of the investigation. This will show in a very striking manner the relation of the physical character of the soil to the class of tobacco which can be successfully produced in any locality, and will give a basis for the mapping of soils adapted to any class or type of tobacco.

The soils collection of the Department amounts now to over 3,000 samples, from various parts of the United States and several foreign

countries, representing many of the most important soil areas of the world. About half of these have been carefully examined. Many of the results have been published, while others await the collection and examination of more material, in order to develop special lines of investigation or to write up the soils of special agricultural areas or industries.

WATER CONTENT OF SOILS.

Much time has been given, as heretofore, to the study of the water content of various soils, to determine the normal quantity in soils of different formations and of different agricultural areas as well as the normal variation which may occur in the water content without detriment to the plants. The importance and bearing of this work can only be really appreciated by seeing the relation of the soil moisture to the general economy of plant growth.

Under ordinary circumstances the temperature of the air is a prime cause of the evaporation or loss of water by plants; the relative humidity of the air, together with the general atmospheric movements, controls the evaporation, while the moisture of the soil supplies loss due to evaporation. For a steady and continuous growth of plants there must be a certain relation therefore between temperature, which is the cause of evaporation; the relative humidity, which is a controlling factor; and the soil moisture, which supplies the loss. It has been possible to determine from the field records what may be called the line of drought for a number of the important soils of the country. This is the minimum amount of water which the soil must contain under ordinary conditions of temperature and humidity in order that the crop shall not suffer. This line of drought depends, of course, upon the texture of the soil as well as upon the temperature of the air, the kind of plant, and the stage of development. The texture of the soil has an influence on this, because in a soil of fine texture, made up mainly of clay and fine sand, the movement of water is quite slow and there must be a large quantity of water in the soil to insure an adequate supply moving up to the roots of the plant to replace that lost by evaporation. This explains the well-known fact that a plant may thrive in one soil with 5 per cent of water, while it would perish in another soil containing 15 per cent.

The temperature and relative humidity of the air affect this line of drought, because with a low temperature and a high relative humidity there is comparatively little loss of water and a smaller supply in the soil may be ample, while with a high temperature, unless this is balanced by a very high humidity, there will be a greater evaporation from the plant and a larger amount of water will be needed in the soil to insure an adequate supply to the plant. The kind of crop and the stage of development will obviously affect the location of the line of drought for any soil, as different plants require different amounts of water, and this differs again according to the stage of the development. The water supply of the soil is, therefore, a very important factor in climatological studies. It is clearly possible to establish approximately for any soil and for any crop the relation which must at all times exist between the temperature, the relative humidity of the air, and the amount of moisture that must be present in the soil to maintain the balance. To this end records have been kept of the amount of moisture in a number of the principal soil formations of the country, some of the records extending over three or four seasons, accompanied with careful [illegible] of the daily condition of the soil and of the

MEASUREMENT OF SOIL MOISTURE.

The electrical method of moisture determination mentioned in my last report and described in a bulletin issued by the division has been still further perfected. Sixteen stations have been equipped with these electrical instruments in various parts of the country and in several important types of soil. Records have been kept at these stations for periods varying from two to four months, and it has been found that the method can be used by anyone with ordinary care. As a result of these field records I feel perfectly satisfied with the operation of the method, and equally satisfied that it will prove of great value in soil investigations as well as of practical and commercial value. One great value of the method is that the electrodes are permanently buried in the field at any depth desired and the field can be cultivated or cropped as usual. The electrical resistance between the electrodes is read off from a scale, and this resistance varies according to the square of the water content. By once thoroughly standardizing the electrodes, therefore, and by the use of tables which are furnished by the division, the moisture content of the soil can be determined at any time from the electrical resistance of the soil.

Having perfected this method of moisture determination, in which the moisture can be rapidly and readily determined successively at the same point without any disturbance of the soil, it is possible to study in a very satisfactory way the influence of different methods of cultivation, of fertilization, and of irrigation upon the water content of soils. This is a line of very practical work, made possible only by the perfection of such a method as this. Plans are being drawn up now for an exhaustive study of the influence of methods of cultivation, fertilization, and cropping upon the water content of the soil in different parts of the country.

Investigations are also being vigorously pushed on the physical properties of soils and on practical methods of determining these in the field. Some very important results have just been attained, explaining more fully than ever before the real cause of the capillary movement of water in soils. It has been found that this is due to the curvature of the water surface between the grains of soil. In fine-grained clay soils and in dry soils generally the curvature of the surface of the water between the grains is very great. On account of the great curvature of the surface there is a pressure outward and a tendency for water to be drawn into the spaces between the grains from any other part of the soil where there is more water and where the curvature of the surface of the water between the grains is less. This is the practical cause of the capillary movement of water in soils upon which plants depend for their current supply. Methods of cultivation and of fertilization have an influence on this, and investigations will be continued along these lines to see the extent of the influence we have upon the movement of the moisture in the soil.

RECOMMENDATIONS.

The work of the division has developed far enough to give a reliable basis for the classification of soils according to their agricultural values and capabilities. It is quite possible to outline the areas of soil in any agricultural district adapted to any particular class of crops. The value of this work to the farmer will be obviously very great, and it can only be undertaken in its broadest aspect by the

national Government. There are still large areas of land along the Atlantic coast and in other parts of the country lying out as waste lands which are adapted to the raising of early truck crops. There are large areas of land in many of our States, well adapted to the production of different classes of tobacco and to other agricultural and horticultural crops, which are not at present used to the best advantage because the relations of the soils to crops are not fully understood or appreciated. These soils can now be differentiated and mapped, and I consider it very advisable that this work be started. It would be a matter of great practical value to have a map of the truck soils of the Atlantic Coast or a map of the tobacco soils of the principal tobacco districts of the country. In view of the importance of this work and of the fact that our investigations have developed sufficiently to warrant our undertaking it now, I have recommended an increase in the appropriation for this division of $5,000 to provide for the necessary field investigations and additional laboratory work and the preparation of maps.

DAILY RECORDS OF MOISTURE.

Continuous records should be kept of the daily moisture content of some of the principal soils of the United States; for example, some of the cotton soils, and wheat, corn, tobacco, truck, and fruit lands. This is necessary not only to study the relation of soil to crops, as is being done at present by the division, but for the statistical value of the records. The records of the moisture content of the soils would give a basis for the more intelligent estimation of the climatological conditions and the probable yield of crops. Arrangements could be made for having these observations taken in the principal soil formations of the country with comparatively small expense to the Department.

The method employed is capable of being used by any intelligent person located at a convenient distance from the place where the instruments should be installed to represent the typical soil conditions. The data so collected should be published at frequent intervals in connection with the meteorological data of the Weather Bureau and with the crop estimates of the Statistical Division. The statistical work of the Weather Bureau, the Division of Statistics, and the Division of Soils is closely related, and it seems advisable that it should be published together in an official statistical publication of the Department, so that the relation of the weather conditions, the soil conditions, and the crop conditions and estimates, which are based upon these, may all be brought together for the information of the public and as a basis for an exhaustive study of the climatology of our country.

LEGISLATIVE AMENDMENT.

In conclusion, I wish to call your attention again to the limitations placed upon the Department in securing competent observers on account of the law prohibiting additional compensation to a person [illegible] tional work. This makes it impossible for the observations of [illegible] Bureau, of the Statistical Division, and of the Division [illegible] to be taken by the same person, whereas it would obviously [illegible] very much better if the work could all be performed by the same person. The crop correspondent would have a better knowledge upon which to base his estimates if he was equipped with meteorological and soil instruments while the soil observer would be better equipped

to render successful service if he was in charge of the meteorological outfit of the Weather Bureau and in touch with the statistical work of the Division of Statistics.

Furthermore, it would be possible by combining the work to greatly reduce the number of persons upon whom the Department depends for its statistical information without in any way impairing the value of the services performed, and it would enable the Department to pay more in many cases and to secure the services of more able men without increasing the total cost of the service. Congress should be asked, therefore, to allow an additional salary for additional work to a person whose place of private business and whose location fits him to perform duties for several of the divisions in the Department, especially where, as in this case, the total salary would not exceed $400 or $500 per annum.

REPORT OF SUPERINTENDENT OF EXPERIMENTAL GARDENS AND GROUNDS.

U. S. DEPARTMENT OF AGRICULTURE,
EXPERIMENTAL GARDENS AND GROUNDS,
Washington, D. C., August 28, 1897.

SIR: I have the honor to submit a report upon the work done in the Experimental Gardens and Grounds for the past year, with suggestions for the current year.

Respectfully, WILLIAM SAUNDERS,
Superintendent.

Hon. JAMES WILSON, *Secretary.*

WORK OF THE YEAR.

The operations in this division are largely routine in their general character. The work of keeping the grounds properly stocked with plants and attending to their culture, maintaining the lawns, roadways, flower beds, and other ornamental plant areas throughout the park, involves constant care and the expenditure of much labor.

The conservatories and plant structures also demand considerable labor. The collection of plants in the conservatories proper are mostly those of economic value, and serve as a nucleus from which selections are made of such as appear to merit propagation for experimental purposes and introduction as industrial plants, if a suitable climate can be found for their growth, and other conditions favorable for profitable culture.

Other greenhouses are appropriated to the growth and propagation of the pineapple, the Citrus family, olive trees for the production of cuttings, and for other similar purposes.

About 20,000 various ornamental plants are propagated annually to supply the flower garden and flower beds on the Department grounds.

The distributions during the last fiscal year consisted mainly as follows: Strawberries, 36,500; grapes, native and foreign, 7,000; olive plants, 3,900; camphor trees, 2,900; fig cuttings, 4,000; pineapples, guavas, cinnamon, pepper, citrus, vanilla, coffee, loquat, etc., 1,800.

The greenhouses and conservatories are mainly in good repair. After a service of twenty-five years, during which time they received but little in the way of repair except a coat of paint occasionally, a thorough overhauling was commenced. This involved the removal of all the glass and inspection of the woodwork, much of which was found to require renewal. After repairs the glass was replaced and the woodwork received two coats of paint. The roofs of the conservatory were found to be very much decayed, requiring the renewal of the greater portion of the woodwork. So far as finished the houses

are rain proof and show but little leakage or drip. This is principally due to the method of glazing, putty being used only in bedding the glass, none being used on outside of sash bars. This work of renewal of glass roofs is not yet completed, but will be continued until all have been overhauled.

OUTLOOK FOR CURRENT YEAR.

The concrete roads and walks are worn out and need repairing. Some portions of these can be renewed at once, but a thorough renewal must wait appropriations for this specific purpose.

Particular attention has been directed of late to the propagation of olive trees. Of these the Department has a select assortment, and considerable interest is being developed in their culture; but, like all introductions of this character, a very great amount of persistency is necessary before planters take up a new industry in earnest. This is the case with most introductions. Plants will be received, planted, and neglected, until someone more careful than his neighbors reaches some degree of success, extends his plants, and ultimately attains a profitable expectancy; then others will follow in the same line, and if successful the culture will have been inaugurated.

The camphor plant may be taken as an example of the introduction of a new crop. For more than twenty years the Department has been distributing this plant in the extreme Southern States, first as a shade tree and as a shelter to orange groves, and more recently as of very promising industrial value. After all these years planters are now taking a special interest in its culture, trees are in great demand, and their value as economic plants will be properly tested.

With regard to future work exclusive of ordinary care of the grounds and glass houses, the propagation of such economic plants as may seem advisable will be continued. At present the olive is the leading factor in propagation, as it is considered desirable to fully introduce and encourage olive culture in such of the Southern States as seem suited to its profitable growth. Judging from past experience, years may elapse before this will be accomplished.

In conclusion, we are constantly on the alert to introduce plants of possible economic value and to propagate and distribute them for trial.

REPORT OF THE AGROSTOLOGIST.

U. S. DEPARTMENT OF AGRICULTURE,
DIVISION OF AGROSTOLOGY,
Washington, D. C., September 1, 1897.

SIR: I have the honor to submit my third annual report upon the work of the Division of Agrostology for the fiscal year ending June 30, 1897, together with an outline of plans for the current fiscal year and recommendations for future work, presented in accordance with your letter of instructions under date of June 21, 1897.

Respectfully,

F. LAMSON-SCRIBNER,
Agrostologist.

Hon. JAMES WILSON, *Secretary.*

WORK OF THE YEAR.

The work of this division, as authorized by Congress, is the investigation of grasses and forage plants, embracing all points relating to the natural history, geographical distribution, uses, and adaptability to special soils and climates. The law also authorizes the establishment and maintenance of experimental grass stations and the employment of necessary labor and purchase of supplies for carrying them on.

GRASS GARDENS.

There are at present two grass gardens maintained by the division, one located on the grounds of the Department of Agriculture and the other at Knoxville, Tenn. The one on the grounds of the Department covers less than an acre, but has served a very useful purpose in growing many varieties of grasses and forage plants. During the past year seeds of between 400 and 500 varieties of these plants were sown in this garden, the greater proportion of which germinated and made a fair growth, enabling visitors and others interested to become acquainted with their general characteristics and habits. This garden has attracted much public attention, particularly in its exhibition of the grasses suitable for lawns. The seeds used were procured through the collections of field agents and by exchanges with foreign countries.

The grass garden at Knoxville, Tenn., embraces about 7 acres of ground, and cultures there are conducted upon a more extensive scale. More than 200 varieties were grown in this garden during the past year, a considerable proportion of which are perennials, and their further development will be watched with interest.

FIELD WORK.

The field work authorized during the past year embraces investigations, first, of the grasses and forage plants of the Southwest, including the States and Territories of Texas, Kansas, New Mexico, and Arizona; second, of the Northwest, including Colorado, Wyoming, and Montana; third, of the Gulf States, including those States bordering on the Gulf east of Texas. This work was begun by sending circular letters and blank forms of inquiry to parties likely to be interested in the work, whose addresses were obtained in various ways. The following circular letter, which in all essential points is the same as those directed to other sections, was sent to the Southwestern region:

WASHINGTON, D. C., *April 10, 1897.*

DEAR SIR: The Secretary of Agriculture has directed that this division shall begin an investigation of the forage problems and conditions that exist throughout the grazing regions of the Southwest, including the States and Territories of Kansas, Arkansas, Arizona, New Mexico, and Texas, giving particular attention to the native grasses and forage plants, their abundance and value, their preservation, and the possible methods to be employed in restoring the grazing value of those regions which have become valueless through overstocking or other causes. Preliminary to taking up this work, we wish to put ourselves in communication with such parties as are interested in improving the forage conditions of the Southwest, first, for the purpose of gaining a more definite idea as to what the present conditions are, and, second, how best to improve these conditions. After gaining this knowledge and ascertaining definitely where this division may work most effectively, agents, under the direction of the Secretary of Agriculture, will be sent into the field in order to gain a personal knowledge of the conditions and requirements, and for determining the most practical methods of introducing and cultivating those grasses and forage plants which are most likely to succeed, and which will at the same time be best suited for the needs of the stock raisers and dairymen. Any assistance you may render in furthering this undertaking, either by sending in the names and addresses of leading farmers and stock raisers of your region or by furnishing information relative to the points above indicated, will be highly appreciated.

F. LAMSON-SCRIBNER, *Agrostologist.*

Approved:
JAMES WILSON,
Secretary of Agriculture.

The replies to these circular letters have been very encouraging and have shown a widespread and deep interest in the work of the division. More than 1,000 answers have been received, and the information thus acquired will be of the greatest value in carrying on the investigations.

Early in May the assistant chief of the division was detailed to work n the Southwestern region under general instructions to secure all possible information in regard to the existing forage conditions of the cattle ranges by direct observation and by consulting with the leading stock [illegible] throughout that section. He has spent most of his time [illegible] various points in Texas where the cattle interest is of first [illegible] and has everywhere met with a cordial reception and has [illegible] possible extent by the citizens of that State [illegible] second assistant in the division [illegible] investigations in the [illegible] been spent chiefly [illegible] has been most satis- [illegible] Wyoming, was [illegible] in investigations

in the southwestern part of that State, and Mr. David Griffiths, of South Dakota, was appointed for a like period to work in conjunction with an assistant of the division in the same field.

The investigations, begun two years ago in Colorado, have been continued this year by the temporary appointment of Prof. C. L. Shear, of Lincoln, Nebr., who was assigned to work in the southwestern part of the State.

The immediate prosecution of the field work in the Gulf States, in which region collections were made during the past two years by an assistant in the division, has been assigned to Prof. S. M. Tracy, formerly of the Agricultural College of Mississippi. Professor Tracy has been authorized to prepare a report upon the forage plants and forage resources of the States embraced in this investigation.

Reports upon the work performed in the field last year by Profs. C. L. Shear and F. E. Clements in Colorado and Mr. P. A. Rydberg in Montana are now in hand and ready for publication. All the field agents have been instructed to make collections of the grasses and forage plants observed, as well as seeds of those which it seems desirable to propagate experimentally. The amount of material, both of botanical specimens and seeds, thus collected has been large and exceedingly valuable. Special attention has been directed toward collecting seeds of native leguminous forage plants and of those kinds which may be valuable to propagate on saline or alkaline soils. The collection by field agents of herbarium specimens, many of which have been distributed to the leading herbaria of the country, is especially to be commended. The field observations made by Prof. L. H. Pammel, of the Iowa Agricultural College, in the States of Iowa, Nebraska, and Colorado during the years 1895 and 1896 have been secured by the authorization of a report upon the same. This report, together with the specimens collected by Professor Pammel, which serve to illustrate the botanical part of his report, have been received, and the matter designed for publication, now in the hands of the printer, will be published as Bulletin No. 9 of the division.

During the season of 1896 Prof. M. A. Brannon, of North Dakota, was authorized to make certain field investigations in his State, and his report, together with that made by Mr. T. A. Williams, assistant in this division, formerly of South Dakota, and Messrs. David Griffiths and E. N. Wilcox, of the same State, who were given temporary employment, is embodied in Bulletin No. 6 of the division, entitled Grasses and Forage Plants of the Dakotas. In addition to the collections made by the assistants and field agents already referred to, about 400 pounds of seeds of native grasses and forage plants of western New Mexico were obtained by purchase from Mr. J. K. Metcalfe, of Silver City, N. Mex.

SEED DISTRIBUTION.

The demand for new and improved forage plants which will grow and thrive on Western farms is constantly increasing, and it is of some importance that the valuable grasses that are disappearing from the prairies, mountain meadows, and pastures as a result of overstocking should be given a fair trial with the foreign species which are constantly being introduced in order to show what they will do under cultivation. There are many valuable grasses among the several hundred indigenous species. With a view of carrying on investigations along this line by testing the qualities of our native grasses and forage

plants, the seeds which were collected during the season of 1896 were put up in small packages and divided into sets, which were distributed to agricultural experiment stations and individuals who expressed a willingness to cooperate with the Department in this work. There were in each of the first ten sets seeds of 135 species, and the first thirty sets contained 3,730 packages. Ten of these sets were sent to foreign countries from which valuable material has been received in exchange. These countries embraced New South Wales, Victoria, Algeria, Cape Colony, Natal, northwest India, Royal Botanical Gardens at Kew, England, and the experiment station in Switzerland, under the direction of Stebler and Schroeter. Two thousand five hundred packages were sent to experiment stations in this country west of the Mississippi River. The total distribution amounted to over 6,000 packages of seeds. It is hoped and expected that the reports of the cultivations resulting from this seed distribution will be of much practical value.

WORK ON THE HERBARIUM.

During the year 5,000 sheets of mounted specimens have been added to the herbarium. The greater portion of these were from collections made by the field agents, but the number also includes those deposited by the Smithsonian Institution and the Botanical Division. The work of arranging the collection of duplicates into sets has been completed, and these sets have been distributed to the leading herbaria and educational institutions of this country, and seven sets have been sent to the principal herbaria of foreign countries. The number of specimens thus distributed amounts to over 10,000.

ROUTINE WORK OF THE DIVISION.

The routine work of the division consists in preparing and editing reports for publication and the proof reading of the same; attending to the wants and needs of the field agents; answering correspondents, and the naming of collections sent in for identification and those made by the assistants and agents in the field. Many of the replies to circular letters of inquiry demand acknowledgment, and the classifying of the information received through these circulars requires a good deal of time.

In the preparation of the article on "Cow peas," published in the Yearbook, circulars of inquiry were sent out, 1,245 of which were returned with information. The more important data contained in these were embodied in the article referred to. Five hundred and fifty-five returns were received to the circular asking for information relative to "Sorghum as a forage crop." The data thus acquired were published in Farmers' Bulletin No. 50. A special circular upon grass and forage plant investigations was distributed early in the season, to which 1,275 returns have been made. The verification or identification of grasses sent to the division for this purpose has in many cases demanded the expenditure of a great deal of time, and in addition to the work of identifying the larger collections made by agrostologists members of the division staff nearly 3,000 specimens have been identified for correspondents and about 600 letters of advice in regard to the kinds of grasses adapted to various purposes or different localities have been written. Work has been commenced and some progress [illegible] a bibliography of the grasses of North America.

PUBLICATIONS.

An enumeration of the publications of the division will be found in the report of the chief of the Division of Publications. Attention may here be called to the nature of the publications issued. They are of two classes—purely technical publications, in which are described new species or in which lists of collections and revisions of genera are published, and popular or semipopular publications, which deal with practical questions relative to the forage problems of the different sections of the country and the merits of the indigenous or introduced grasses and forage plants. To the latter class belong Bulletins 5 and 6 of the division and Farmers' Bulletins on Alfalfa, Sorghum as a Forage Plant, and on the Soy Bean. The last mentioned is now in the hands of the printer and will be published as Farmers' Bulletin No. 58. The work of preparing illustrations of all the grasses of North America has been continued, and the drawings for this work are now nearly completed. The engravings are being made as rapidly as possible. In order to hasten the publication of these illustrations and render them immediately available, 302 of those already completed were published, with a short descriptive account of each, in Bulletin No. 7. There has been a great demand for this bulletin, and it is hoped that a second edition may soon be issued.

PLANS FOR THE CURRENT FISCAL YEAR.

The limited appropriation made for the work of this division for the current fiscal year does not permit of much modification or any extension of the plans already authorized. The care and maintenance of the grass gardens and the completion of the field work of the season by those who have been detailed or authorized to carry it on and make reports, as already referred to, and the continuance of the preparations for the illustrations of the Hand Book of North American Grasses will, together with the routine work of the office, consume all the available funds. In fact, it has already been found desirable and necessary to curtail to some extent the office work in order to permit the continuance of the authorized field work and experiments, which are deemed of greater value and for which there is a greater demand.

RECOMMENDATIONS.

The interest manifested in the work of the division by Members of Congress and the public generally has been most encouraging. The work has met with hearty approval on all sides, and there has been a constant and urgent demand for extending its operations, particularly in the line of field work and experiments. The appropriations heretofore made have been so limited that very little could be done beyond the maintenance of the routine work. The various demands upon the funds have so divided the appropriation that the amount employed in any one line has been entirely inadequate to develop it to a deserving degree of prominence or point of economic usefulness. The importance of the work is clearly appreciated, and an increase in the appropriation is not only desirable, but will be true economy, inasmuch as it will enable the Secretary to greatly increase the effectiveness of the work and materially add to its usefulness.

The continuance of field explorations and making collections is recommended, and, if the funds appropriated will permit, the extension of this work west of the Rocky Mountains is urged. Owing to the desirability of propagating the more valuable of our native grasses and forage plants, more attention should be given to the collection of seeds and sufficient quantities gathered for the cultivation of these plants upon a practical scale, either at certain selected points or in grass stations established for the purpose. The location of these indigenous grasses is now well known, and labor can be economically employed for harvesting their seeds. Little-known or untried foreign varieties ought to be procured by purchase or through the services of special collectors and introduced into cultivation here under systematic methods. This primary introduction and testing of foreign grasses and forage plants is of the greatest importance, and liberal allowance should be made for its effective prosecution.

The division has many intelligent correspondents in all parts of the country who have rendered real service in the promotion of our investigations by their valued communications or replies to circulars of inquiry. These correspondents often express a desire to cooperate in the work of the division by the cultivation of trial samples of seeds of forage plants, and requests are frequently received for seeds of little-known varieties or for those species designed for special purposes, as, for example, the holding of embankments subject to wash or holding in place drifting sands, or for special kinds of turf-forming grasses. Such seeds are often expensive and are not usually obtainable in sufficient quantities to supply the demands of the Congressional distribution.

It is believed much good may be done and the work of the division greatly promoted if means are provided for furnishing its correspondents, who will report the results obtained, with trial samples of seeds of the grasses and forage plants in question. By this means the adaptability of these plants to special soils and climates, as provided for by law in the establishment of the division, may be determined in a practical manner and in a way which will be most helpful to all concerned. It is further suggested that special experiments be undertaken in selected localities where the work, if successful, may prove immediately useful in the propagation of sand- and soil-binding grasses and those best suited for the formation of turf. Many letters have been received requesting information as to the varieties of grasses to plant on embankments of steam and street railroads, and work might be undertaken directly upon such slopes by the planting of those grasses thought best to meet the end in view in a given latitude. Along our seaboard and the shores of the Great Lakes there are numerous places where much valuable property could be saved from destruction by the judicious planting of grasses which will prevent the drifting of the moving sands. The State of Massachusetts has already done much in this line near Provincetown, on Cape Cod.

In order to accomplish all that is desired in the investigations in the [illegible]st, referred to above, it will be necessary to establish grass gardens [illegible]ose regions where the work is now being carried on, and it is [illegible]mend that grass experiment stations of practical extent be [illegible] [illegible]thern portion of t[illegible] [illegible]anhandle of Texas and in [illegible] [illegible]ana, and the [illegible] appropriations be made [illegible] [illegible]ll be located in the [illegible] [illegible]at [illegible] the vicinity of Great

REPORT OF THE BOTANIST.

U. S. DEPARTMENT OF AGRICULTURE,
DIVISION OF BOTANY,
Washington, D. C., August 14, 1897.

SIR: I have the honor to submit herewith my fifth annual report, containing a review of the work of the Division of Botany for the year ending June 30, 1897, and a statement of some of its needs.

Respectfully,

FREDERICK V. COVILLE,
Botanist.

Hon. JAMES WILSON, *Secretary.*

WORK OF THE YEAR.

FIELD EXPERIMENTS WITH SEEDS.

In my last annual report the need of trial grounds in connection with our seed tests was emphasized, and late last season a small beginning was made in this direction on the Department grounds. This year, however, no space could be spared for this purpose, and a plot of about half an acre of the typical truck soil of the region was secured at Kensington, Md., about 11 miles from Washington. Two series of trials are now in progress, one a simple test of all the varieties of peas and beans now on the market, the other a seed selection experiment with peas. Reports on both of these trials will be submitted at the end of the season. For the present it may be said that the results of the variety tests will be valuable to the Department when, before purchasing seeds this year, it must decide how many of the new varieties offered for sale are worthy of distribution. The seed selection experiments are confirming the results obtained last year in the greenhouse, that large heavy peas produce an earlier and a heavier crop than either unselected or small peas. The total additional cost of these outdoor experiments and variety tests up to June 30, 1897, was about $130.

INVESTIGATION OF NEW CROPS.

Judging from the large number of letters received by the Department asking for information about the cultivation of new or little-known crops, the farmers of the country are ready, in view of the generally lessened profits on staple farm products, to follow any promising suggestions made by the Department in this direction. As the beginning of an effort to meet this demand, an investigation has been undertaken of the subject of chicory cultivation. This country imports about $250,000 worth of chicory root per annum, which is

used as a coffee substitute and adulterant. There is now every prospect that chicory will be made a profitable farm product in the United States and that this amount of money will go into the pockets of American instead of European farmers.

NATIONAL HERBARIUM.

The mutually cordial relations that have heretofore existed between the National Herbarium and the Division of Botany still continue, to the advantage of both institutions. Such collections as come into the hands of the Division of Botany and are no longer needed in its work are turned over to the Herbarium, which, on the other hand, furnishes much-needed facilities to the division in its reference collections and books.

The Coniferæ of the National Herbarium still remain in the custody of the Division of Botany, awaiting the completion of additional balconies in the National Museum building.

Through the kindness of Prof. W. H. Brewer, of Yale University, the Division of Botany has received for examination and distribution the plant collections of the old California Geological Survey of 1860–1867, upon which was based Brewer and Watson's Botany of California. A full set of this collection, which is one of the most valuable series of plants that has ever come into the hands of the Department, will be turned over to the National Herbarium when ready for mounting

ECONOMIC HERBARIUM.

After the transfer of the National Herbarium to the National Museum building the importance of creating at the Department a reference herbarium of economic plants began to be appreciated. During the past year the beginning of such a collection has been made by preserving a full series of pressed specimens of all the varieties of peas and beans grown on our trial grounds, besides a large number of seedlings of miscellaneous agricultural plants drawn from our greenhouse germination tests, a series of weeds collected in the vicinity of Washington or received from correspondents, and a series of poisonous and medicinal plants obtained in the same way.

NATURAL RESOURCES.

Our examination of the flora of the Columbia plains in eastern Washington and eastern Oregon was completed in the summer of 1896 by working southward and westward from the Blue Mountains to the southern end of the Cascades. The first part of the report on three years' work in these plains, the great grazing area of the Northwest Coast, has been completed, but its publication has been postponed in order to permit the incorporation of the data now being secured by local botanists in remote portions of the area.

This year the only piece of work of this kind in course of prosecu- [illegible] the examination, by a field agent, of the flora of the Wallowa [illegible] ins of northeastern Oregon

[illegible] has been carried on along essentially [illegible] the preparation of circulars and by an [illegible] correspondence [illegible] garlic, *Allium vineale*,

a very troublesome weed in pastures and wheat fields east of the Alleghanies from southern New York to North Carolina, was published early in the year. Another circular, giving warning regarding three newly-introduced weeds of the mustard family, has also been issued, and a paper on weed migration, pointing out the ordinary means of the introduction and spread of weeds in this country, has been prepared for the Yearbook.

A notable example of the eradication, upon receipt of advice from the Division of Botany, of a newly-introduced weed is the case of tumbling mustard at South Bethlehem, Pa. This plant, so damaging to the wheat fields of Manitoba, had become well established on the ore piles and in the grounds of the Bethlehem Iron Company, and in reply to a correspondent who sent a specimen for identification, a copy of Circular No. 7 and a letter relative to the character of the weed was sent. The company immediately pulled and burned every plant on their premises, and this spring when the first yellow flowers appeared they repeated the operation. Late in June, when tumbling mustard should be in its most flourishing condition, our correspondent was unable after several hours' search to find a plant for a herbarium specimen.

A novel case of damage wrought by a plant, namely, the obstruction of navigation in a river, has been investigated during the past year. The plant known as water hyacinth, *Piaropus crassipes*, a native of South America, cultivated for ornament in fountains and ponds, had escaped into the St. Johns River in Florida, where it had propagated itself with wonderful rapidity. The field work connected with the investigation was performed, through the courtesy of the Chief of the Division of Vegetable Physiology and Pathology, by one of the assistants in that division, and the results have been published in the form of a bulletin.

POISONOUS PLANTS.

Nearly the whole time of the assistant in charge of pharmacological investigations has been taken up in the preparation of a Yearbook article on a few common poisonous plants, and later, to satisfy a persistent popular demand for an elementary treatise on the subject, in preparing matter for a bulletin which will treat of about fifty of our best known species. This larger report will be ready for issue during the present fiscal year.

TESTING SEEDS DISTRIBUTED BY THE DEPARTMENT.

The Division of Botany has assumed the task of making germination and purity tests of all the seeds distributed by the Department under the specific appropriation for that purpose. On account of the seed being purchased from five different firms in essentially duplicate lots, the work of testing has been exceedingly onerous. As all seeds falling below our standards of vitality were retested under various conditions, so as to remove any possible doubt as to the correctness of the result, it was necessary to make in all 5,288 tests in order to ascertain the value of 879 varieties of vegetable seeds and 148 varieties of flower seeds. The total cost of this work, as measured by the salaries of the persons engaged upon it, was about $2,600. By a modification, if practicable, of the system of purchasing seeds, so as to secure all of one variety in one lot, the cost of testing would be much reduced.

SEED INVESTIGATION.

In the matter of equipment for the work of seed investigation about 5,000 bottles of seeds have been added to the collection during the year, making a total of over 15,000 bottles. Two of the large germination chambers devised by Mr. Hicks and adopted as a standard for the experiment stations have also been purchased, but beyond these little apparatus not already on hand has been required.

Two articles have been prepared for the Yearbook, one on home seed growing, the other on the superior value of heavy in comparison with light seed for the purpose of sowing. A circular on the vitality of seeds treated with carbon bisulphide to kill injurious insects has also been published.

Reports on the following topics are now in preparation: The general subject of clover seed; the chemical treatment of seeds to aid germination; the germination of immature weed seeds, and the standards of purity and germination.

SUPPORT OF THE PURE-SEED MOVEMENT.

Recognizing the great importance of pure seed in agriculture, the Division of Botany has encouraged wherever possible the sentiment in favor of improvement in this regard. It makes tests free of charge for farmers, seedsmen, and investigators, and conducts a large correspondence on this subject.

During the year we have cooperated with the agricultural experiment stations as heretofore, especially by the official representation of the division, through Mr. Hicks, on a committee of the Association of Agricultural Colleges and Experiment Stations to devise a uniform system of seed testing. Thus communicated, the methods we have pursued and found satisfactory are being adopted by other institutions.

AMERICAN MEDICINAL FLORA.

The Pan-American Medical Congress has undertaken, through a commission, to prepare for publication a complete medicinal flora of North and South America, the first portion laid out being the preparation of a medicinal flora of the United States in charge of a special subcommission. By invitation of the chairman of the commission and with the consent of the Secretary of Agriculture, the Botanist has become a member of the subcommission. At the same time the Smithsonian Institution has undertaken to bring together the material on which the flora is to be based. In this way, it is believed, some of the resources of these two establishments in the direction of economic botany may be made widely useful.

PUBLICATIONS.

The literature issued during the year consists of two numbers of contributions from the U. S. National Herbarium, one bulletin, and three circulars [illegible] Yearbook articles [illegible] prepared but not issued within the fiscal [illegible]

[illegible] No. 1. Flora [illegible] Repor[illegible] collection of plants made by C. H. [illegible] By A. S. Hitchcock. I. Crepis occidentalis and its Allies. [illegible] Horn Mountains of

Wyoming. By J. N. Rose. IV. Leibergia, a new genus of Umbelliferæ from the Columbia River region. By John M. Coulter and J. N. Rose. V. Roseanthus, a new genus of Cucurbitaceæ from Acapulco, Mexico. By Alfred Cogniaux. Issued August 5, 1896.

Contributions from the United States National Herbarium, vol. 5, No. 1. General Report on a Botanical Survey of the Cœur d'Alene Mountains in Idaho during the summer of 1895. By John B. Leiberg. Issued January 25, 1897.

Circular No. 9. Wild Garlic. By Lyster H. Dewey. Issued March 2, 1897.

Circular No. 10. Three New Weeds of the Mustard Family. By Lyster H. Dewey. Issued May 15, 1897.

Bulletin No. 18. The Water Hyacinth, and its Relation to Navigation in Florida. By Herbert J. Webber. Issued June 7, 1897.

Contributions from the United States National Herbarium, vol. 5, No. 2. Notes on the Plants used by the Klamath Indians of Oregon. By Frederick V. Coville. Issued June 9, 1897.

Circular No. 11. The Vitality of Seed Treated with Carbon Bisulphid. By Gilbert H. Hicks and John C. Dabney. Issued June 24, 1897.

CORRESPONDENCE.

The correspondence of the division continues to require a large amount of time. During the year some 2,500 inquiries have been answered by letter, in addition to several thousand answered by the sending of printed circulars or other reports prepared for such purposes.

NEEDS FOR THE ENSUING YEAR.

BUILDING.

The subject of a building has been so frequently mentioned in the reports of the Botanist that nothing need be said at the present time except to repeat that the inconvenient location and separation of the branches of the Division of Botany, bad lighting and ventilation, insufficiency of space, and the danger of fire still demand as their only proper remedy an adequate amount of space in a modern fireproof building. At the present time the Division of Botany is unable to provide any laboratory space whatever for the investigation of poisonous and medicinal plants, and is compelled to rely on the courtesy of other divisions of the Department.

PERMANENT TRIAL GROUNDS.

The satisfactory results of the trial grounds maintained at Kensington, Md., during the present season show that the permanent possession of such grounds would many times repay their cost. Nothing could more enhance the value of the Department seed distribution than a trial-ground test of the seeds it is proposed to distribute. All large seed establishments maintain such grounds as a necessary part of their business equipment, and by this provision the repetition of many of the mistakes heretofore made by the Department in its distribution of seeds could be prevented. Furthermore, the command by the Department of a trial ground would be of great general value to agricultural science, leading, as it necessarily would, to a scientific study of our field crops. The Department would be enabled to keep, as it ought, a record of all the new plants it distributes, in the form not only of a sample of the seed, but also of an authoritative specimen of the plant itself grown in the trial ground and suitably preserved for future reference.

ADDITIONAL ASSISTANT.

One important subject of botanical investigation, to which attention has been called heretofore, is that of natural agricultural belts or areas as indicated by the natural vegetation. It is well known to most farmers that certain kinds of timber are indications of certain agricultural capacities of the soil, and it is believed that a critical study of the subject will bring out facts capable of practical application. None of the present assistants can well be spared for this investigation and it is very desirable that steps be taken to secure the services of an additional assistant competent for the work.

REPORT OF THE DIRECTOR OF THE OFFICE OF ROAD INQUIRY.

U. S. DEPARTMENT OF AGRICULTURE,
OFFICE OF ROAD INQUIRY,
Washington, D. C., September 1, 1897.

SIR: I have the honor to report regarding the work of this office for the year ending June 30, 1897, and to lay before you the plans designed for the ensuing year.

Very respectfully,

ROY STONE, *Director.*

Hon. JAMES WILSON, *Secretary.*

OPERATIONS OF 1897.

The operations of the fiscal year 1897 continued, until your accession, upon the plans stated in my report for 1896. Many successful meetings were held in various States, and the literary work of the office included publications entitled "Progress of Road Construction in the United States," "Traction Tests," "Highway Repairing," "Brick Paving for Country Roads," "Going in Debt for Good Roads," "Cost of Hauling Farm Products in Europe," "Discussion of Road Improvement in Maine, North Carolina, New York, and Illinois," and "The Forces which Operate to Destroy Roads."

DISTRIBUTION OF LITERATURE.

The literature of the office, now numbering 20 bulletins and 15 circulars of information, has been much sought for, but its distribution has been greatly hampered by the regulations placing a price upon the bulletins. I beg, therefore, to renew my suggestion that these publications be placed on the footing of Farmers' Bulletins. They are not calculated to be of private advantage to anybody, but are to be used solely in educational work. Few people can be expected to buy them for that purpose, while many would take the trouble to use them if they could be had free of cost.

OBJECT-LESSON ROADS.

Under your injunction to push the practical side of our work in preference to the academic I have reduced the force in the office and made such arrangements as I could for the outside work of object-lesson road building. And also, as you desired, have endeavored to promote experiment in steel roadways.

No funds being provided by Congress for actual road construction, I have been compelled to carry on road building by means of contri-

butions from the various parties interested, viz, the agricultural colleges and experiment stations, the citizens concerned, and the manufacturers of road implements and machinery; the Road Inquiry contributing only a small installment of the expenses, through the payment of freight on machinery and part payment of wages of experts sent in charge of the machines, but keeping full control of the construction in order that the roads may be creditable to the Government when done.

Two sections of road were built at the Agricultural College and Experiment Station in New Jersey in the month of June. A detailed statement of their cost and illustrations of machinery employed and the methods of construction will be prepared for the Yearbook of 1897.

OPERATIONS AND PLANS FOR 1898.

In the fiscal year 1898 the work of "object-lesson" or "Government" road building has been continued at Geneva, N. Y., and a road 1½ miles long, connecting the Agricultural Experiment Station with the city, is nearly completed. The attention of the public and of the road officials of the State has been invited to this work by the director of the station, and hundreds have already visited it.

Machinery has been shipped to Kingston, R. I., for a road at the Agricultural College of that State. Road Expert Harrison has taken charge also of building a short length of road at Warren, Pa., and has built a small sample at Ithaca, N. Y.

STEEL ROADS.

In response to circular letters sent to the principal steel manufacturers in the United States various plans of construction have been offered, and the Cambria Iron Company, of Johnstown, Pa., especially, has joined heartily with this office in the development of such plans.

Upon investigating what has been already done by private experiment I am confirmed in my former opinion that a well-designed steel trackway can be successfully built and will be profitable to use and maintain, especially in localities where other road materials are scarce.

The considerable expense involved in preparing to roll special shapes of rail has prevented much experiment in this direction heretofore, but the Cambria Iron Company is disposed to aid in the matter and will undertake this expense whenever a definite order for 1 mile of road shall be received. I have not succeeded as yet in getting such order and it will probably be necessary to ask Congress for a small appropriation for this purpose. The cost of material for a mile of road will be $3,500. It will be advisable to put this down in several places, widely separated, in order that the test may be more complete [illegible] more thorough.

[illegible] and will exhaust all the funds that can be spared [illegible] appropriation unless something additional is pro- [illegible] many urg[illegible] den[illegible] agricul[illegible] lages [illegible] tations fo[illegible] machinery free, [illegible] $500 for each [illegible] lp to build from [illegible] agricultural col-

leges and experiment stations, and any required number of outfits can be put in the field at once. If additional funds are provided early in the coming session of Congress this work can be carried on in many of the Southern States during the winter.

PLANS AND ESTIMATES FOR 1899.

The work of 1899 will continue to be of the same character, but will evidently require much larger means. If no additional appropriation is made for 1898 that for 1899 could profitably include at least $5,000 for construction of experimental steel roads and $25,000 for object-lesson roads, in addition to the $8,000 required for office and general expenses.

REPORT OF THE CHIEF OF THE SECTION OF FOREIGN MARKETS.

U. S. DEPARTMENT OF AGRICULTURE,
SECTION OF FOREIGN MARKETS,
Washington, D. C., September 1, 1897.

SIR: In accordance with the instructions contained in your order of June 21, 1897, I have the honor to submit herewith the report of the Section of Foreign Markets.

Respectfully, FRANK H. HITCHCOCK,
Chief.

Hon. JAMES WILSON, *Secretary.*

WORK OF THE SECTION OF FOREIGN MARKETS.

The Section of Foreign Markets was instituted March 20, 1894, under a clause in the act of appropriations for the Department of Agriculture setting aside $10,000 for the purpose of making "investigations concerning the feasibility of extending the demands of foreign markets for the agricultural products of the United States."

This appropriation has been expended chiefly in the preparation of a series of bulletins and circulars designed to convey information regarding such opportunities as exist for the extension of our export trade in American farm products. During the period beginning with the organization of the section in 1894 and ending June 30, 1897, eight bulletins, relating to as many different countries, and seventeen circulars, devoted to special topics, were given to the public.

BULLETINS PUBLISHED.

The countries treated of in the bulletins already issued are (1) the United Kingdom of Great Britain and Ireland, (2) the German Empire, (3) France, (4) Canada, (5) Netherlands, (6) Belgium, (7) Norway, and (8) Sweden. Each country is considered with a view to its possibilities as a customer for the products of American agriculture. To ascertain what these possibilities are it is important first of all to be informed as to the agricultural resources of the country under consideration. A full account is therefore given of the extent and character of the principal crops grown, and also of the number and varieties of live stock raised. This is followed by a careful review of the country's foreign commerce, and more particularly of its import trade in agricultural produce, the purpose being to show how far the national requirements exceed the home supply, making it necessary to import from other countries. Official statistics are presented as to the quantity of the various products annually imported and the different sources from which they are received, and these facts are

accompanied by such information regarding customs duties and regulations, equivalents of foreign moneys, weights and measures, rates of exchange, etc., as may be of service to American producers in quest of a foreign market.

Each bulletin is supplemented by a series of reports received through the medium of the State Department from our consular representatives stationed in the particular country concerned. The object of these reports is to set forth such facts regarding the several consular districts as are likely to assist in creating there a larger demand for our products. With this end in view they frequently give important information as to the nature and quality of the goods preferred, methods of sale, prices paid, means of transportation, etc., enhancing thereby the practical value of the bulletins.

CIRCULARS ISSUED.

As regards the various circulars issued by the Section of Foreign Markets prior to July 1, 1897, some idea of their character and scope may be had from the list of titles, which is as follows: (1) Peaches and Other Fruits in England; (2) American Dried Apples in the German Empire; (3) Imports and Exports for 1893 and 1894; (4) An Example for American Farmers and Dairymen; (5) The Treaty of Shimonoseki between China and Japan of April 17, 1895, and Our Possibilities of Trade with those Countries; (6) Imports and Exports for 1893, 1894, and 1895; (7) Extension of Markets for American Feed Stuffs; (8) The Manchester District of England as a Market for American Products; (9) Imports and Exports for 1893, 1894, 1895, and 1896; (10) Course of Wheat Production and Exportation in the United States, Canada, Argentina, Uruguay, Russia, and British India from 1880 to 1896; (11) Agricultural Products Imported and Exported by the United States in the Years Ended June 30, 1892 to 1896, Inclusive; (12) Sources of the Principal Agricultural Imports of the United States during the Five Years Ended June 30, 1896; (13) Distribution of the Principal Agricultural Exports of the United States during the Five Years Ended June 30, 1896; (14) Hamburg as a Market for American Products; (15) Exports of Cotton from Egypt; (16) Our Trade with Cuba from 1887 to 1897; (17) United States Wheat for Eastern Asia.

SPECIAL INQUIRIES.

In addition to the facts presented in the series of bulletins and circulars described, a large amount of information is disseminated in response to special inquiries coming from correspondents interested in the exportation of agricultural products. The work of supplying the information thus requested constitutes one of the most important duties of the section. The inquiries received cover a wide range of investigation, and considerable labor is sometimes necessary to furnish the data desired. Among the numerous sources of inquiry to which information has been supplied may be mentioned other Depart- [illegible] Government, Senators, Congressmen, and [illegible] chambers of commerce [illegible] agricultural organizations, [illegible] periodicals devoted to the subject of [illegible] frequent demands that are made upon [illegible] relative to the extension of our for- [illegible] requests received for the publica-

tions of the office, afford conclusive evidence of the lively interest that is felt in a work having for its object the further development of our export trade.

PLANS FOR THE CURRENT FISCAL YEAR.

During the current fiscal year the work of the Section of Foreign Markets, so far as definite plans have as yet been devised, will be conducted along practically the same lines as in the past. The publication of bulletins and circulars similar to those already described will be continued, and it is hoped by a judicious selection of subjects to present information that will be both timely and useful. Since the beginning of the fiscal year a circular giving a detailed account of the commerce carried on between the Hawaiian Islands and the United States, with special reference to its agricultural features, has been published. The demand for this circular, owing to the lively interest created by the proposed annexation of the islands, has been very large. Another publication that attracted considerable attention because of its timeliness was the circular recently issued regarding our trade with Cuba during the last ten years. A similar circular giving a careful review of our commercial relations with Canada, in so far as they concern American agriculture, has been planned, and it is thought that the facts to be presented will carry special interest because of the close competition now existing between the two countries in regard to certain agricultural products. It is believed that an accurate statement of our border trade in farm produce will prove to be particularly useful, and for this reason the circular reviewing our dealings with Canada will be followed by a publication of like nature respecting our commercial intercourse with Mexico. A circular has also been planned in reference to the trade that is so rapidly springing up between the United States and Japan. Considerable time has already been devoted to the compilation of a series of statistical tables showing the imports and exports of butter by the principal countries of the world, and these tables will form the subject-matter of a circular to be issued in the near future. Other circulars of a similar character, treating from the standpoint of commerce some of the most important of our agricultural products, will follow in due time. Bulletin No. 9 (Denmark) of the "World's Markets" series is nearing completion. The bulletins of this series, being of a somewhat elaborate nature, entail a large amount of labor in their preparation, and unless the clerical force of the section is increased, it is believed that better results can be attained by the more frequent publication of smaller bulletins and circulars devoted to special subjects. It is hoped, however, that sufficient clerical assistance will be provided to permit the continuation of this series of reports as well as the publication of the smaller bulletins and circulars in question. The correspondence of the office has grown considerably, and it is probable that hereafter more time and labor will be required in attending to this branch of the work.

Were the necessary means available, a much wider scope could undoubtedly be given to the work of the section, and its services to the farmer be correspondingly enhanced. The great importance that attaches to the line of investigation pursued can not be denied. An agricultural productiveness far in excess of the consuming capacity of our population places at our disposal an annual surplus of farm produce that must either be sold abroad or become a burden to the home

market. The possession of markets beyond the sea is therefore a matter of the highest moment to our agriculturists. In competing for these markets the United States is obliged to cope with other great producing nations, and to do this successfully an accurate and thorough knowledge of the conditions to be met is highly essential. The field for investigation, comprising as it does the entire list of foreign countries, is practically unlimited, and it is confidently believed that with larger means at its disposal the Section of Foreign Markets could accomplish far greater results than those already attained. To perform with any degree of facility the work that has been planned for the future there should be a material increase in the clerical force of the office. Funds could also be expended to great advantage in the employment of one or more special agents charged with the duty of making personal investigations abroad. The work of such agents, if properly directed, should yield important results.

ESTIMATES.

In view of the foregoing facts, it is earnestly recommended that the appropriation for the work of the Section of Foreign Markets during the fiscal year ending June 30, 1899, be increased to $20,000. This amount would provide for the additional clerical assistance needed, and would also permit the employment, if thought advisable, of one or more special agents for service abroad.

REPORT OF THE SPECIAL AGENT FOR THE PURCHASE AND DISTRIBUTION OF SEEDS.

U. S. DEPARTMENT OF AGRICULTURE,
OFFICE OF SPECIAL AGENT FOR THE PURCHASE
AND DISTRIBUTION OF SEEDS,
Washington, D. C., July 6, 1897.

SIR: I have the honor to submit herewith the report of the distribution of seeds furnished this Department by T. W. Wood & Sons, The Ullathorne Seed Company, H. W. Buckbee, W. Atlee Burpee & Co., and L. L. May & Co. for the fiscal year ending June 30, 1897.

Respectfully,

ENOS S. HARNDEN,
Special Agent.

Hon. JAMES WILSON, *Secretary.*

SEED DISTRIBUTION, 1897.

As the appropriation of $150,000 for the distribution of seeds for the fiscal year ending June 30, 1897, provided that $130,000 must be expended in the purchase of seeds, leaving but $20,000 to put up and mail the same, it was decided as necessary to purchase the seeds already put up and to provide that the contractors must do all the work of handling and delivering to the mails in the several cities in which contracts might be let.

In order that the seeds distributed should be adapted to the sections in which they were to be distributed, the United States was divided into six sections, embracing such States as were as near as possible similar in latitude and climatic conditions. This division of the contract made it possible to encourage competition among the smaller seed houses, as there are only a few houses who would be able to handle a contract of $130,000 in seeds successfully, for want of stocks of seeds. It was also seen that by placing the order for seeds to be furnished in six contracts, a contractor to be selected in each section and the seeds mailed from some point within that section, the transportation through the mails would be greatly less than by the old way of sending the seeds out from one central point.

The States were divided as follows:

Section No. 1 comprising the States of Virginia, North Carolina, South Carolina, Florida, Georgia, and the Third, Fourth, Fifth, Sixth, Seventh, Eighth, Ninth, Tenth, and Eleventh Congressional districts of Kentucky (also providing for two Senatorial quotas from this section for Kentucky), the First, Second, Third, Fourth, and Fifth Congressional districts of Tennessee, and the Seventh and Eighth Congressional districts of Alabama (providing for one Senatorial quota for Alabama from this section).

Section No. 2, the States of Missouri, Arkansas, Louisiana, Kansas, Oklahoma, Texas, Mississippi, and the First and Second Congressional districts of Kentucky, the Sixth, Seventh, Eighth, Ninth, and Tenth Congressional districts of Tennessee (providing for two Senatorial quotas for Tennessee from this section), and the First, Second, Third, Fourth, Fifth, Sixth, and Ninth Congressional districts of Alabama (providing for one Senatorial quota for Alabama from this section).

Section No. 3, the States of Washington, Oregon, Idaho. California, Nevada, Utah, New Mexico, Arizona, and Colorado.

Section No. 4, the States of Wisconsin, Illinois, Indiana, Ohio, and Michigan.

Section No. 5, the States of West Virginia, Pennsylvania, New York, New Jersey, Maryland, Delaware, Connecticut, Rhode Island, New Hampshire, Vermont, Massachusetts, and Maine.

Section No. 6, the States of Montana, Wyoming, North Dakota, South Dakota, Nebraska, Iowa, and Minnesota.

Contracts were entered into by this Department as follows:

Section No. 1, with T. W. Wood & Sons, Richmond, Va., for 2,856,000 packets vegetable seeds, at $5.65 per M; 153,000 packets flower seeds, at 6.01\frac{15}{61}$ per M; 70,700 packages of field seeds, at $36.60 per M.

Section No. 2, with The Ullathorne Seed Company, Memphis, Tenn., for 3,570,000 packets of vegetable seeds, at $6 per M; 191,250 packets flower seeds, at $5 per M, and 56,850 packages of field seeds, at 38.32\frac{37}{80}$ per M.

Section No. 3, with W. Atlee Burpee & Co., Philadelphia, Pa., for 1,280,000 packets of vegetable seeds, at 6.26\frac{427}{840}$ per M; 72,000 packets of flower seeds, at $8.75 per M, and 12,000 packages of field seeds, at 49.47\frac{1}{8}$ per M, to be delivered at the post-office in the city of Denver, Colo., or, at the option of this Department, at Washington, D. C.

Section No. 4, with H. W. Buckbee, Rockford, Ill., for 3,696,000 packets of vegetable seeds, at $6 per M; 198,000 packets of flower seeds, at $7.91 per M, and 60,000 packages of field seeds, at 27.99\frac{7}{10}$ per M.

Section No. 5, with W. Atlee Burpee & Co., Philadelphia, Pa., for 5,628,000 packets of vegetable seeds, at 5.81\frac{5}{8}$ per M; 301,500 packets of flower seeds, at $8.75 per M, and 77,250 packages of field seeds, at 43.29\frac{191}{300}$ per M.

Section No. 6, with L. L. May, St. Paul, Minn., for 2,023,839 packets of vegetable seeds, at $5.18 per M; 96,750 packets of flower seeds, at $11.36 per M, and 16,125 packages of field seeds, at 52.11\frac{25}{129}$ per M.

The total quantity of seeds distributed amounted to 19,053,839 packets of vegetable seeds, 1,022,500 packets of flower seeds, and 292,385 packages of field seeds. (Field seeds contracted for in section 6 were reduced by 540 packages of English blue grass (*Poa compressa*) by amendment to contract on account of inability to secure seed free from weed seed that was prohibited in contract from distribution.)

Following is a list of seeds distributed:

VEGETABLE SEEDS.

	Varieties.	Packets.	Packets per pound.
Asparagus	4	42,342	100
Beans	32	423,420	*a* 128
Beet	10	2,147,062	65
Cabbage	23	2,130,418	100
Carrot	11	465,374	100
Cauliflower	9	56,561	300
Celery	10	96,058	100

a Per bushel.

VEGETABLE SEEDS—Continued.

	Varieties.	Packets.	Packets per pound.
Corn (sweet)	19	423,420	a 128
Cucumber	18	338,728	50
Eggplant	1	42,342	300
Lettuce	29	2,130,418	130
Melon (musk)	19	338,728	50
Melon (water)	17	338,728	50
Mustard	1	79,333	100
Okra	4	14,279	50
Onion	15	1,752,200	95
Parsley	6	43,342	135
Parsnip	5	211,710	100
Peas	21	423,420	a 128
Pumpkin	11	338,728	50
Radish	30	2,161,278	60
Ruta-baga	8	423,420	46
Salsify	2	42,342	100
Squash	16	338,728	70
Tomato	18	2,119,042	230
Turnip	9	2,130,418	52

a Per bushel.

Of flower seeds there were 1,022,500 packets, an equal number of each of the following varieties:

FLOWER SEEDS.

Variety.	Packets per pound.	Variety.	Packets per pound.
Ageratum conspicuum mexicanum	1,200	Gaillardia, finest mixed	800
dwarf blue	1,200	Godetia, mixed varieties	500
Adonis autumnalis	500	Hollyhock, finest mixed double (perennial)	800
Agrostemma coronaria (perennial)	500	Helichrysum (everlastings), mixed colors	1,000
Alyssum martimum	500	Ipomea (moonflower)	300
Amarantus tricolor	500	Lathyrus latifolius (everlasting pea) perennial)	300
Asters, chrysanthemum flowered, mixed varieties	500	Linum grandiflorum	400
Truffants perfection, mixed varieties	500	Lupins, varieties of	200
Victoria, mixed varieties	500	Mauranda barclyana, mixed colors	1,000
imbricated Pompon, mixed varieties	500	Mignonette, varieties, Golden Queen, Machette, Spiral, Parsons white	600
Washington, mixed varieties	500	Nasturtiums, best 12 varieties, dwarf	200
double-quilled varieties	500	Nemophila, mixed	400
Giant Emperor	500	Œnothera, mixed	600
Balsams, finest mixed varieties	500	Pansy, 12 distinct varieties	1,200
Brachycome iberidifolia	800	Pentstemon, mixed colors (perennial)	800
Calendula officinalis	600	Petunia, choice striped and blotched	1,200
Calliposis lanceolata, "Golden glory" (perennial)	1,000	Phlox drummondii, 12 named varieties	500
drummondii	1,000	Platycodon grandiflora (perennial)	400
elegans picta	1,000	Papaver orientale (perennial)	800
Iberis coronaria	600	Poppy, the Shirley	600
umbellata	600	Poppy, 6 double varieties	600
sempervirens	600	Portulaca, double mixed	1,200
Dianthus Chinenis (double variety)	1,000	Ricinus (castor bean) mixed ornamental sorts	150
Heddewigii (double variety	1,000	Sanvitalia procumbens, double	800
Imperialis (double variety)	1,000	Scabiosa, mixed dwarf double and tall German	800
laciniatus (double variety)	1,000	Schizanthus, mixed varieties	800
snowflake (double variety)	1,000	Snapdragon, Antirrhinum, mixed varieties	800
Cockscomb, variety Empress	600	Sweetwilliam (Dianthus) barbatus, mixed (perennial)	500
Collinsia, finest mixed varieties	200	Stock, ten-weeks, 12 named varieties	500
Convolvulus tricolor, choice mixed	1,000	Sweet peas, 20 named varieties	50
Cobæa scandens, purple and white	1,000	Thunbergia (mixed varieties)	200
Cosmos hybrida, mixed colors	300	Verbena, best mixed	1,000
Cypress vine (Ipomœa quamoclit)	500	Zinnia (collection of best strains)	500
Datura cornucopia	500	Gomphrena globosa	1,000
Delphinum brunonianum (perennial)	500		
formosum (perennial)	500		
nudicale (perennial)	500		
Digitalis (Foxglove), best spotted varieties (biennial)	600		
Marvel of Peru (four o'clocks), mixed varieties	300		

FIELD SEEDS.

Variety.	Packages.	Variety.	Packages.
Field corn	10,395	Meadow fescue	15,170
Canada field peas	2,040	Alsike clover	8,040
Kafir corn	3,387	Orchard grass	5,280
Panicum miliaceum	10,835	Cowpeas	4,707
Spring oats	19,875	Crimson clover	14,978
Winter oats	12,150	Pearl millet	5,212
Japan buckwheat	19,875	Cotton	32,600
Vivia villosa	27,086	Australian salt bush	858
Bromus inermis	2,397		

An inspector and an assistant were appointed for each section to take charge of the seeds being put up by the contractor, furnished with instructions by the seed expert in charge of pure seeds investigations of this Department as to the manner of drawing samples of seeds for testing, and directed to see that all franks sent him were properly pasted upon the mail packages and sent as per order of Members of Congress and the honorable Secretary of Agriculture.

Receipts were taken by these inspectors from the postmasters for all shipments made.

Seeds were sent to 2,390,919 addresses in the United States from the several points of distribution. In many cases Members of Congress ordered their seeds sent out in large quantities to individuals for redistribution, so that this number of addresses does not cover the number of mail packages sent.

The reports of the inspectors give in detail the number of mail packages sent out and to whom they were addressed.

On April 15 the seed still remaining in the hands of the contractors at Richmond and Memphis were forwarded to this Department by freight, prepaid, and the inspectors at those points released. May 1 all seed still due from the contractor at Philadelphia were forwarded to this Department and a deduction on the price of the contract agreed upon in the amount of $350 for the privilege of closing up the work at that time instead of storing and caring for the seed until this Department should order them out, or until June 30, as agreed upon in the contract. Also, in connection with the shipment of seeds contracted for to be sent to section 3 by the contractors in Philadelphia, 10,000 packets of flower seeds were put up gratis for the privilege of sending the balance here instead of delivering them in Denver.

The seeds still in the hands of the contractor at St. Paul were forwarded to this Department May 3 by mail, and the work closed at that point on that date. Balance of seeds still due the Department from section 4 were not sent in until May 15, when all seed still due at that date were forwarded by mail, and all contracts for seeds to be [illegible]rnished were practically closed.

[illegible]he closing of the six contracts in this manner netted a saving to this [illegible]partment of about $1,000, by the releasing of the inspectors and [illegible]r clerks and [illegible]ne reductions on the contract price.

[illegible]here are still [illegible] hand for distribution the following: Field seed, [illegible]ckages [illegible] of mail packages [illegible]egetable seeds, 12 [illegible] packages.

REPORT OF THE CHIEF OF THE BUREAU OF ANIMAL INDUSTRY.

U. S. DEPARTMENT OF AGRICULTURE,
BUREAU OF ANIMAL INDUSTRY,
Washington, D. C., September 15, 1897.

SIR: I have the honor to transmit herewith a report of the operations of the Bureau of Animal Industry for the fiscal year ended June 30, 1897.

Respectfully,

D. E. SALMON, *Chief.*

Hon. JAMES WILSON, *Secretary.*

WORK OF THE YEAR.

MEAT INSPECTION.

It has still been impossible to inspect all the animals slaughtered in the United States for human food, the meat of which is to be shipped in the channels of interstate or foreign commerce. The force engaged in this inspection has been enlarged from time to time and the number of animals inspected has increased each year. During the past year all of the beef exported to Europe and the greater part of the pork and other meat products exported have been inspected in accordance with the law. There has, however, been a large amount of meat slaughtered for the interstate trade which it has been impossible to inspect with the appropriation at the disposal of this Bureau. This is a very important matter, and every effort should be made to secure the inspection of all the animals which the law contemplated should be inspected, as otherwise there is a tendency to have doubtful or suspicious animals slaughtered at abattoirs where inspection has not yet been established.

The progress during the year has been satisfactory, and if the appropriation is increased so as to allow a continued development of the inspection service at the same rate, it will not be many years before the intent of the law is entirely accomplished. The meat-inspection force is now a very competent and efficient one. The inspectors and assistant inspectors are veterinarians, many of whom have passed a rigid examination under the Civil Service Commission, and the greater part of the nonprofessional members of the force have had such long experience that their services are extremely valuable. The persons obtained by certification from the eligible list of the Civil Service Commission have, as a rule, been more competent and efficient than those obtained before the force was brought within the classified service, and it has been possible to maintain

much better discipline than was the case when a considerable proportion of the force believed that they had influence which made them more or less independent of the head of the Department and the Chief of the Bureau.

The work of meat inspection was in operation at 128 abattoirs and packing houses, located in 33 cities.

Following is a table showing the number of ante-mortem inspections made in the stock yards and at abattoirs, with the number condemned on this inspection at the abattoirs, and the number rejected in the stock yards. The animals rejected in the stock yards are tagged and held subject to future disposition—either slaughtered, shipped to the country for stocking purposes, or released when in proper condition for food:

Ante-mortem inspection.

Animals.	For official abattoirs in cities where the inspection was made.	For abattoirs in other cities and miscellaneous buyers.	Total inspections.	Condemned at abattoirs.	Rejected in stock yards.
Cattle	4,289,058	3,960,967	8,250,025	195	24,951
Sheep	5,179,643	2,864,712	8,044,355	757	10,503
Calves	259,930	189,053	448,983	56	2,597
Hogs	16,813,181	8,753,563	25,566,744	12,858	40,287
Total	26,541,812	15,768,295	42,310,107	13,866	78,338

Below is a statement showing the number of post-mortem inspections made at the abattoirs where inspection was maintained, and the number made on animals rejected in the stock yards and slaughtered at various places, with the number of carcasses and parts condemned as unfit for human consumption. The rigid character of the ante-mortem inspection in the stock yards is evidenced by the fact that on the post-mortem examination of rejected animals the greater part is passed as fit for food.

Post-mortem inspection.

Animals.	Number of inspections.			Carcasses condemned.			Parts of carcasses condemned at abattoirs.
	At abattoirs.	On animals rejected in stock yards.	Total.	At abattoirs.	Stock-yard inspections.	Total.	
Cattle	4,242,216	11,634	4,253,850	6,618	3,725	10,343	10,290
Sheep	5,209,161	4,733	5,213,894	3,086	1,652	4,738	1,213
Calves	273,124	787	273,911	238	311	549	42
Hogs	16,808,771	30,263	16,839,034	*a* 41,562	12,929	54,491	*b* 37,750
Total	26,533,272	47,417	26,580,689	51,504	18,617	70,121	49,295

ncludes 3,243 condemned on microscopic examinatio
Include 0,08[illegible] condemned on microscopic examination

[illegible] inspectors 641
[illegible] had been rejected
[illegible] Animal Industry.
[illegible] inspecti[illegible] ification was affixed
[illegible] 5,161,927 carcasses
[illegible] carcasses of hogs, and

The meat-inspection stamp was placed on 4,692,069 packages of beef products, 3,711 of mutton, and 7,463,259 of hog products, including 120,322 containing microscopically examined pork.

The number of certificates of inspection for exported products issued was 21,825 for meat products which had undergone the ordinary inspection, and 7,560 for pork microscopically examined in addition to the regular inspection. These certificates covered the shipment of 1,128,717 quarters and 20,259 pieces of fresh beef, 1,249 carcasses of sheep, 3,721 carcasses of hogs, 519,017 packages of beef, 3,711 packages of mutton, and 411,948 packages of pork, of which 119,549 contained pork which had been microscopically examined.

There were sealed 12,664 cars containing inspected meat for shipment to packing houses and other places.

The cost of this work was $385,796.36, which, while including all the expenses incident to the work, makes an average of 0.91 cent for each ante-mortem inspection.

For the purpose of comparison the following table is given:

Table showing the number of animals inspected before slaughter for abattoirs having inspection.

Fiscal year.	Cattle.	Calves.	Sheep.	Hogs.	Total.
1891	83,891				83,891
1892	3,167,009	59,089	583,361		3,809,459
1893	3,922,174	92,947	870,512		4,885,633
1894	3,862,111	96,331	1,020,764	7,964,850	12,944,056
1895	3,752,111	109,941	1,344,031	13,576,917	18,783,000
1896	4,050,011	213,575	4,710,190	14,301,963	23,275,739
1897	4,289,058	259,930	5,179,643	16,813,181	26,541,812

MICROSCOPIC INSPECTION OF PORK.

In the microscopic examination for trichinæ 1,881,309 specimens were examined—550,291 from carcasses and 1,331,018 from pieces. The number of samples found infected was 13,325, of which 3,243 were from carcasses and 10,082 from pieces of pork.

The number of pounds exported was 43,572,355, of which only 1,001,783 pounds went to countries not requiring a certificate of microscopic inspection.

The cost of this inspection was $111,669.30, an average per specimen examined of 5.94 cents, or an average of 0.256 cent for each pound of microscopically examined meat exported.

The following table shows the exports of microscopically inspected pork, 1892–1897:

Fiscal year.	To countries requiring inspection.	To countries not requiring inspection.	Total.
	Pounds.	*Pounds.*	*Pounds.*
1892	22,025,698	16,127,176	38,152,874
1893	8,059,758	12,617,652	20,677,410
1894	18,845,119	16,592,818	35,437,937
1895	39,355,230	5,739,368	45,094,598
1896	21,497,321	1,403,559	22,900,880
1897	42,570,572	1,001,783	43,572,355

INSPECTION OF VESSELS AND EXPORT ANIMALS.

The number of inspections of domestic cattle for export was 845,116; number tagged, 410,379; number rejected, 1,565; number of inspections of domestic sheep, 348,108; number rejected, 189. The number of Canadian cattle inspected was 13,136; number rejected, 12; Canadian sheep inspected, 23,289; rejected, 72.

The number of domestic animals exported under the supervision of inspectors consisted of 390,554 cattle (5,501 shipped from Chicago by way of Montreal), 184,596 sheep (2,231 from Chicago via Montreal), 22,623 horses, and 100 mules. Canadian animals were exported from United States ports as follows: 13,124 cattle, 23,217 sheep, and 6,185 horses.

The number of certificates issued for cattle was 1,563; the number of clearances of vessels was 954.

Following is a statement showing the number of cattle and sheep inspected at time of landing by the inspectors of the Bureau stationed in Great Britain, and the number and percentage lost in transit:

From—	Cattle.			Sheep.		
	Number landed.	Number lost.	Per cent.	Number landed.	Number lost.	Per cent.
United States	367,277	2,124	0.57	166,936	2,184	1.29
Canada	10,409	199	1.88	22,247	492	2.17
Total	377,686	2,323	0.61	189,183	2,676	1.39

The percentage of loss in export animals during the year has been moderately low, although not as low as in some previous years. In 1894 the percentage of loss of cattle was 0.37; in 1895 it was 0.62, and in 1896, 0.32. The loss of sheep in 1894 was 1.29; in 1895, 2.7; in 1896, 1.16. We can never expect a uniformly low rate, on account of the great variation in conditions of the weather.

The cost of the inspection of export animals, the Texas fever work, and the inspection of animals imported from Mexico, was $102,555.16. If it may be assumed that half of this amount is properly chargeable to the export work, the cost of inspecting the 575,150 domestic cattle and sheep exported would be $51,277.58, or 8.9 cents per head. The number of inspections made on these animals in this country was 1,193,224 and in Great Britain 534,213, making a total of 1,727,437, the average cost of each inspection being 2.97 cents.

Following is a statement showing the inspection of domestic cattle and sheep for export and the number exported for 1897 and previous years:

[illegible]	Cattle.				Sheep.		
	Number of inspections.	Number rejected.	Number tagged.	Number exported.	Number of inspections.	Number rejected.	Number exported.
[illegible]	[illegible]16	1,565	410,379	390,554	348,108	189	184,596
[illegible]	[illegible]82	1,303	377,639	365,345	733,657	893	422,603
[illegible]	57,756	1,000	324,339	32[illegible],299	704,044	179	350,908
[illegible]	25,243	184	360,580	363,535	135,780	.....	85,809
[illegible]	[illegible]542	292	280,570	289,240	.....	.....	.....

SOUTHERN CATTLE INSPECTION.

During the quarantine season of 1896 there were received and yarded in the quarantine divisions of the various stock yards 42,869 cars, containing 1,154,235 cattle; 43,529 cars were cleaned and disinfected.

The supervision and control of the movement of cattle from the district infected with Southern, or splenetic, fever involves the placarding of cars and stamping of waybills, the proper yarding of Southern cattle in order that they may not come in contact with susceptible animals, and, when reloaded at one station, the notification of the inspector at the point of destination or at intermediate stations.

In the noninfected area in Texas, 220,543 cattle were inspected and permitted to be moved to other States by trail and railroad for grazing.

INSPECTION OF IMPORTED ANIMALS.

The number of animals imported from Mexico and inspected at the ports of entry along the boundary line was as follows: 292,479 cattle, 43,393 sheep, 12 hogs, and 171 goats.

The number imported from Canada and inspected at northern boundary ports, and not subject to quarantine, consisted of 42,953 cattle, 331,137 sheep, 212 swine, 2,635 horses, 9 mules, and 1 goat.

Below is a statement of the animals imported and quarantined for the prescribed period at the different quarantine stations:

Station.	Number of cattle.	Number of sheep.	Number of swine.
Littleton, Mass	1	102	13
Garfield, N. J	36	115	42
St. Denis, Md	0	2	0
Vanceboro, Me	1	0	0
Houlton, Me	2	10	0
Newport, Vt	1	0	0
Richford, Vt	3	0	0
Rouse Point, N. Y	4	0	0
Ogdensburg, N. Y	144	0	0
Buffalo, N. Y	165	0	0
Port Huron, Mich	5	0	0
Total	362	229	55

There were also 14 goats and 18 camels at the Garfield station, making a total of 678 animals quarantined.

An experiment is now in progress in Page County, Iowa, to determine to what extent and at what cost hog cholera can be prevented or controlled by sanitary regulations. The legislature at its last session passed a special act giving authority to destroy animals and to enforce necessary quarantine regulations. The funds available for this experiment are not sufficient, but it is hoped that the work may be sufficiently thorough in a part of the county to indicate what may be accomplished by the enforcement of such regulations. Experiments are also being made to learn what can be accomplished by killing only the plainly diseased animals and treating those exposed with hog-cholera antitoxin. It is yet too early to form an idea of the results that will be obtained through these experiments, further than to state that the antitoxin evidently has a beneficial effect. The laboratory and experiment station are now engaged upon investigations looking to the production of an antitoxin of greater protective power and at less expense than has been possible heretofore.

WORK OF THE PATHOLOGICAL DIVISION.

DESTRUCTION OF CATTLE TICKS.

Probably the most important work which this division has had in charge has been the experimental study of the effect of different substances in destroying the ticks which spread the infection of Texas fever. For a long time it appeared as though no mixture could be obtained which would kill these parasites without severely injuring the cattle which were treated. Recently it has been found that a petroleum product known as paraffin oil will destroy the ticks without greatly irritating the skin of the animals to which it is applied. It is thought that by dipping the cattle twice in this oil, with an interval of a few days, all the ticks will be destroyed, and the animals, even from the infected district, may thereafter be shipped with safety to any part of the country. If this hope is fulfilled the dipping of cattle from the infected district must soon become general, and will save millions of dollars to the Southern States. At present such cattle must be kept separate and in quarantine pens, and sold as quarantined animals, at less prices than they would bring in case they were free from restrictions. The general dipping of infected cattle would also prevent the infection of cars and stock yards and enable this Bureau to prevent the dissemination of Texas fever, with less hardship to the owners of cattle and with greater safety to the stock interests.

BLACK LEG.

An effort is also being made to prevent the losses from the disease known as black leg, or symptomatic anthrax, by distributing to the owners of herds where such losses occur a vaccine that will produce immunity. The ravages of this disease in some of our States have become very discouraging to the owners of cattle, particularly those who have endeavored to grade up their herds and breed the best beef-producing varieties. Many owners of large herds have reported annual losses ranging from 8 to 14 per cent. This disease appears to be quite easily prevented by vaccination. Heretofore, however, the methods used in this country have required two vaccinations, with an interval of ten days or more, and the trouble and expense of a double vaccination, added to the cost of the vaccine, has deterred many stock owners from adopting this method of prevention. The Pathological Division has experimented with a vaccine prepared by a special method and which produces sufficient immunity to resist the disease with one vaccination. This division has prepared a large quantity of this vaccine and has distributed it for experimental purposes. By securing this material free of charge and obtaining immunity with a single operation, the method has been so simplified and cheapened that cattle owners who [illegible] suffered from the disease [illegible] anxi[illegible]

[illegible] been [illegible] siderable [illegible] cases ma[illegible] animals supposed [illegible] with [illegible] variety [illegible] opinions have been [illegible] rabies a[illegible] the extent to which [illegible] few institutions which are pre- [illegible] mals [illegible] affected with

this disease, and consequently the work of the Pathological Division in this direction is of great importance. A considerable number of undoubted cases of the disease have been discovered in this way, and it has been found that some mysterious outbreaks of disease among cattle were really attributable to this cause.

WORK OF THE BIO-CHEMIC DIVISION.

This division has manufactured and distributed to State authorities during the past year sufficient tuberculin to test 57,000 cattle for tuberculosis, and sufficient mallein to test 1,400 horses for glanders.

This division has also succeeded in manufacturing an ink which is of great assistance in branding carcasses and pieces of inspected meats. Such branding answers the purpose of identification in many cases, as well as seals and tags, and where used results in a great saving of money, since it can be applied much more rapidly and costs for material very much less. About 70 gallons of this ink have been prepared and shipped to the various meat-inspection stations during the year.

This division has also experimented in the preparation of serums for the treatment of tuberculosis, hog cholera, and swine plague, but the results up to this time are not such as to enable the Bureau to introduce such methods in its practical work.

An experiment has been made by cooperation between the Biochemic Division, the Pathological Division, and the Chemical Division of the Department for determining the alleged poisonous properties existing in cottonseed meal. American and Egyptian meals have been fed in very large quantities, but without producing any disease or any evidence of poisoning. The animals in the experiment thrived and gained rapidly upon the feed, even when the ration was increased to extraordinary quantities of the meal. Other investigations of a chemical nature have been in progress, which will be reported in detail elsewhere.

WORK OF THE ZOOLOGICAL LABORATORY.

During the fiscal year 1896–97 the Zoological Laboratory has continued its work in studying animal parasites. Considerable time has been consumed making specific determinations of specimens which are referred from the Inspection Division or from sanitary officials, physicians, or zoologists in various parts of the country. Aside from these determinations the laboratory has been occupied with statistical hygienic work and original technical investigations.

With a view to determining the value of the German microscopic examination of pork for trichinæ the various outbreaks of trichinosis in that country from 1881 to 1895 have been collated. As might be expected on theoretical grounds, a number of cases of this disease have occurred from German pork which the German officials have inspected and declared free from trichinæ. The number of such cases, however, is greater than one would expect from the German regulations, and shows conclusively that the German system of inspection is far below the degree of thoroughness usually ascribed to it. Over 40 per cent of all the cases of trichinosis thus far collected for Germany for the fifteen years referred to has been caused by pork which the German inspectors have examined and declared to be free from trichinæ, while about 14 per cent of all the cases in Germany during the same years was due to pork which in some way

escaped the sanitary officials. In some cases the inspector would fail to examine the meat; in others it was examined and condemned, but afterwards stolen and placed on the market. It is a remarkable fact that with all these cases of trichinosis, which are laid at the door of the German inspection and the German pork, there was not a single case of the disease in Germany during the fifteen years referred to which the German sanitary authorities have been able to show was due to American pork.

As another line of sanitary study the Zoological Laboratory has prepared for the use of the Bureau inspectors a bulletin on certain animal parasites found in meats, with special reference to their direct or indirect transmissibility to man. Most important among these is the *Echinococcus hydatid*, which appears to be more common in this country than formerly supposed. As this is the cause of a very fatal disease in man it behooves sanitary officials to take early and proper precautions to prevent its further spread.

Various laboratory and field experiments upon scab have been begun and are still in progress.

For about two months the entire attention of this laboratory was occupied with a study of the parasites of the fur seal, undertaken at the request of the United States Treasury Department. An extensive report on the subject has been submitted to the United States Seal Commission for publication.

Owing to the unsatisfactory state of knowledge concerning most of the American parasites it is necessary for this laboratory to undertake considerable study of a very specialized and technical nature. One bulletin, half of which was composed of technical details, on the parasites of poultry has been issued, and a technical bulletin on certain parasites of hares and rabbits and their relation to the parasites of cattle, sheep, and horses, prepared by this laboratory, has been published by the National Museum.

Finally, the laboratory has made an extensive study of all the various codes of zoological nomenclature in preparation for the meeting of the International Commission on Zoological Nomenclature, at which this Department was represented. This movement, inaugurated by the last International Zoological Congress, has resulted in final mutual concessions on the part of scientific men of different countries, and the few remaining points of disagreement in this subject have been done away with, and we now have a completely uniform set of technical names in all countries.

WORK OF THE DAIRY DIVISION.

The general survey of the condition of the dairy industry in different parts of the country, which was begun immediately after the organization of the division in July, 1895, has been continued through the medium of the regular force aided by a few special agents. This nquiry has been made by single States and groups of States and has esulted in several reports, some of which have been printed and others are in hand awaiting revision and publication.

A special inquiry has been in progress in like manner as to the milk supply and service of representative cities and large towns in the United States, and the field work, so to speak, has been completed at [illegible] points.

The collection of dairy data in general continues with a view to its [illegible] arrangement and future use in the form of circulars of information [illegible] bulletins and the like.

The calls for specific information by letter have greatly increased, as well as the routine work of the office and the volume of correspondence in general. This service, together with preparing several publications, has so occupied the office force as to greatly retard the important work of collating and indexing for permanent use and reference the mass of data which is constantly accumulating.

During the year there have been published eight bulletins and three circulars prepared in the division, besides contributions to the Yearbook of the Department and to the Annual Report of the Bureau of Animal Industry, in all comprising 287 printed pages.

Work is well advanced upon a compilation showing the movement of dairy products in the United States from producer to consumer, the condition of and important changes in the principal domestic markets, and the dairy export interests of the country, all to be offered for publication as a bulletin under the title of "Commerce of the Dairy," as a suitable supplement to "Statistics of the Dairy," already published.

The chief and assistant chief of the division have visited during the year centers of dairy interest in 23 States, and collected information for future use. Incidentally, the same officers have attended general meetings of 13 State and similar organizations of dairymen, and have been enabled thereby to meet hundreds of the representative men connected with this industry in various parts of the country, and to establish relations which will be of material future benefit to the general work.

Soon after the establishment of the division, attention was directed toward the condition of the foreign trade of the United States in dairy products. It was noticed that the cheese trade in general was depressed and demoralized, mainly as a consequence of the heavy decline in exports during recent years, the causes for which were discussed in the Yearbook for 1895. Also, that a surplus of good butter was beginning to show itself for the first time in this country, rendering an enlarged market and new outlets of importance. It became known that Canada had secured nearly all the trade for cheese in Great Britain which the United States had lost, and this had been done through the direct instrumentality of the Canadian Government in encouraging, aiding, and instructing cheese factories and improving means of transportation. Canada was found, in addition, to be entering upon a similar course of developing and patronizing the creamery system of butter making and establishing a foreign trade with this product.

It was therefore evident that active measures should be taken to reestablish and extend foreign markets for the surplus butter and cheese produced in the United States, and early in the year a definite recommendation was made from this office for preliminary work in this direction.

Arrangements were begun in March for making experimental exports to foreign markets of carefully selected butter from creameries in the large butter-producing sections of the United States. These shipments commenced in May, have been made every three weeks, and it is proposed to continue them until near the close of the calendar year. The trial exports made thus far have been from the port of New York to the London market, via Southampton.

Without anticipating the results of the season's trials, or the report to be made thereon, it can be already asserted that English merchants of reputation and influence have been better convinced than ever

before of the high quality of butter obtainable in different parts of this country, and the practicability of placing it in British markets from ten to fourteen days after churning, and without appreciable deterioration. The terminal facilities and the accommodations for refrigerated storage during ocean transit are not yet what is desired in kind or capacity, but it is evident that if the commercial demands increase and remain sufficiently constant the transportation facilities will become adequate and satisfactory.

These trial exports serve the double purpose of obtaining useful information for our own people, as producers and sellers, and of diffusing desirable information among prospective customers. A very widespread interest in this matter has been developed in this country, as shown by the comments of the public press and the voluminous correspondence already resulting. The probable benefit in extending the foreign market for American butter seems to make it desirable to repeat the trials another year, with an enlarged field of operations.

WORK FOR THE FISCAL YEAR ENDING JUNE 30, 1898.

EXTENSION OF MEAT INSPECTION.

The most pressing work of this Bureau for the coming year is the extension of the meat inspection to abattoirs engaged in an interstate business which have not yet been included in the service. Until all the establishments which kill for shipment to other States have been included the object of the law in preventing the sale of diseased carcasses for human food will not be accomplished, and there will be a discrimination in favor of those which have received the inspection and against those which have not been able to obtain it. There is also a demand for increased microscopic inspection, which is necessary to permit the marketing of American pork products in the principal countries of continental Europe. The exports of these products fluctuate largely from year to year, according to the condition of the market, and consequently it is impossible to foresee the expenditure which will be necessary to properly provide for the trade. There should either be an emergency fund which can be drawn upon for this purpose or the Department should be authorized to charge a reasonable sum, say 5 cents per specimen, for the microscopic inspection, and the sum so collected should become additional to the appropriation, so that any demands made might be complied with. While I believe the general inspection of meats for sanitary purposes should be made by the Government without charge to the slaughterers, the microscopic inspection is to a great extent a commercial inspection, and the cost of it could be more legitimately assessed against the trade which it benefits. If the packers pay the cost of the inspection, there would be no longer any reason for declining to grant it to all who apply for it, and the inspection could be applied to as small pieces of pork as was deemed advisable. At present the inspection is demanded of pieces weighing only from 1½ to 3 pounds, and on account of the cost of inspecting such small pieces a limit of weight has been set (5 pounds), which is more or less unsatisfactory to the trade.

The inspection of export animals must be continued in order to certify to their healthfulness and maintain the market which has been secured for them in other countries. At present our live animals are shut out of most of the countries of continental Europe, and it is

only by inspection and certifying to their healthfulness that we can hope to have these markets reopened.

INSPECTION AND QUARANTINE OF IMPORTED ANIMALS.

The inspection and quarantine of imported animals must also be continued, in order to prevent the introduction of contagious diseases. While much progress has been made in the control of contagious diseases in the European countries from which our stock men import live animals, most of these countries are now affected with either pleuro-pneumonia or foot-and-mouth disease, or both. The prospects are that there will be more importations from Europe during the coming year than for several years past, and consequently the expense of this inspection may be somewhat increased.

CATTLE AFFECTED WITH TEXAS FEVER.

The inspection and quarantine of cattle from the Texas fever district is an extremely important branch of the service, and it needs constant attention to prevent the infection of the central stock yards and the widespread dissemination of the contagion. When we consider that the quarantine line separating the infected from the uninfected district of the country extends from the Atlantic coast on the east to the Pacific on the west, and is over 4,000 miles in length, the difficulty of preventing violations of the regulations and the unlawful movement of infected stock can be appreciated. During the present year there have been more violations of the quarantine than for several years, owing, no doubt, to the increased demand for stock cattle. It will be necessary to take increased precautions during the next year to prevent the movement of cattle contrary to the regulations, or great damage to the domestic and export trade and a heavy loss of stock will result. The force during the present year is not sufficient to properly guard the line.

Experiments have been in progress for several years to destroy the ticks on southern cattle by dipping them in a suitable mixture for this purpose. If the ticks could be easily and cheaply destroyed the cattle would be freed from the danger of spreading infection. It has been very difficult to find a substance which would destroy the ticks without injuring the cattle. It is thought, however, that an agent has been found in the petroleum product known as paraffin oil, which will accomplish this satisfactorily. At all events, recent experiments have been much more favorable than those previously made, and the hopes of stockmen have been raised accordingly. If this plan of disinfecting the cattle proves successful, it will do away with most of the reasons for violating the quarantine and will no doubt save the stock raisers of the Southern States much loss and embarrassment in shipping which they now endure.

To properly apply this discovery for the benefit of the cattle industry of the whole country, dipping stations should be established by this Department at convenient points, and these should be operated under official supervision in accordance with stringent regulations. By adopting such a plan the dissemination of the disease will be prevented without any hardship to the cattle growers of the infected district. This service will require a larger number of inspectors than are now employed, but the benefit to the country, particularly to the Southern States, will be so great, amounting to many millions of dollars, that there should be no hesitation in putting it into operation.

ERADICATION OF SCABIES.

Measures for controlling and eradicating the disease known as scab or scabies in sheep have been in operation for the past year, though they must be strengthened and made to apply more generally before the prevalence of the disease can be materially reduced. Experiments are being made with different sheep dips for the purpose of determining which is most efficacious and at the same time least injurious to the animal. Experiments are also being made to determine the best methods of treating and controlling hog cholera and tuberculosis. The losses from these diseases are extremely serious, and every effort should be made to reduce them. In order to accomplish this, it is plain that the Department must exercise fuller control over the movement of animals from one part of the country to another, and prevent the dissemination of contagion by stock cars in which diseased animals have been transported. It is probable that more legislation should be enacted, giving the Department greater power in the stock yards that are used for interstate shipments and that more positive authority should be granted for compelling the disinfection of cars and stock pens.

VACCINE FOR BLACK LEG.

The preparation and distribution of vaccine for black leg has recently been undertaken, and a large number of applications for it have been received (amounting at this writing to over 30,000 doses) from stockmen whose animals have suffered from this disease. It appears that in considerable sections of the country the herds of cattle, particularly of important breeds, suffer to the extent of from 10 to 15 per cent of their number annually. It is believed from the reports of vaccinations in other countries that this loss may be reduced to less than 1 per cent.

The manufacture and distribution of tuberculin and mallein for the use of State authorities who cooperate with this Department in the control of contagious diseases should be continued. The tuberculin prepared here has proved to be reliable, and the fact that it can be obtained of the Department by State authorities has made it possible to continue the measures for suppressing tuberculosis where otherwise the expense would have made it almost impossible. It is probable that still greater quantities of tuberculin will be required for the coming year than were used during the past.

NEED OF AN EXPERIMENT STATION.

The work of this Bureau requires the use of an experiment station where a considerable number of experimental animals can be constantly kept. This is needed partly for the diagnosis of diseases met with in the inspection of meat and in the investigation of outbreaks of disease in various parts of the country, and also in the investigation of the nature of diseases and the best methods of treating them. The [illegible]ion which has heretofore been occupied by the Bureau has become [illegible]ffficient for the purpose, and a change has therefore been made to [illegible] farther [illegible] [illegible]y, and where more land can be obtained. The [illegible] such investigations and of pressing them forward as [illegible]ndly as possible can not be overestimated, and no [illegible] the necessity [illegible] work will continue for many years to

come. I would therefore recommend that Congress be requested to authorize the purchase of suitable grounds for such an experiment station, and thus avoid the necessity of moving from place to place and abandoning the improvements which must necessarily be made where this work is being conducted.

In the Dairy Division it is proposed that a special inquiry shall be made of mechanical aids to dairying, with a view of putting that division in possession of complete, definite, descriptive information on this subject; also an inquiry in cooperation with other divisions as to the composition and healthfulness of the various materials used in this country as preservatives of milk and milk products; also an inquiry into the economy of creamery and factory management, including the utilization of waste products, with a view to devising methods for reducing the cost per pound in making butter and cheese. It is proposed to continue the efforts to develop the foreign markets for American dairy products, and it is recommended that Congress be requested to give authority to the Department to apply the funds received from the sale of dairy products shipped abroad by the Dairy Division to the purchase of material for other shipments. This, without increasing the expenditures, would enable a very much larger quantity to be purchased and sent abroad during the year.

INSPECTION CERTIFICATION TO INCLUDE BUTTER, ETC.

It is suggested that an extension of the system of Government inspection and certification at present applied to meats and meat products for export, to include butter, cheese, and condensed milk, would be advisable and may perhaps be necessary in order to maintain the standing of our products in foreign markets. If a trade in pure butter or pure cheese is built up under existing conditions, it may at any time be ruined through the shipment by unscrupulous persons of adulterated products or those which have been preserved with agents generally considered harmful. No doubt a certification limited to products which would grade above a certain fixed and arbitrary standard would be a great benefit and aid in building up and maintaining a greatly increased trade in such products.

The Bureau has entered upon these various lines of work in most cases by specific direction of Congress, and in others under instructions from the Secretary of Agriculture. The value of this work to the country and its urgency need not be enlarged upon, but it is evident that as the work develops and extends increased appropriations are necessary. The increase of the meat inspection alone from less than 4,000,000 animals in 1892 to 26,500,000 in 1897 means an enormous increase in the amount of work that is done and in the force required.

The appropriation, however, is less now than it was in 1892. It is not in the meat inspection alone that the work has increased, but in every other line that has been referred to. It is essential, therefore, for the proper conduct of the work, that the appropriation be restored to the amount which was formerly given, and I would recommend that it be fixed at $800,000, in addition to the statutory roll, for the year ending June 30, 1899.

GREATER LABORATORY FACILITIES NEEDED.

Finally, I invite attention to the great desirability of a fireproof building for the scientific laboratory. The building now occupied is

unsuited for housing the valuable working material which has been accumulated during the thirteen years that the Bureau has been in existence. In the study of animal parasites, for instance, there has been intrusted to Dr. Stiles, our zoologist, the type specimens from the principal collections of the world. If these specimens were destroyed it would be an irreparable loss to science and to practical agriculture. So in each division of the work there are specimens, literature, indexes, and working material of all kinds which represent years of labor and which could not possibly be replaced.

This laboratory is a practical workshop, which aims to make constant and immediate returns to the farmers for the full amount expended for the scientific work of the Bureau. It is accomplishing this by the distribution of tuberculin, mallein, and black leg vaccine, by bringing out the best methods of treating diseases, by determining and informing stock raisers as to the nature of diseases which affect their stock, by perfecting methods for making cattle insusceptible to Texas fever, and for killing the ticks which are the means of spreading the disease. These lines of work are worth millions of dollars to our farmers, and they should not only be encouraged, but put beyond the danger of interruption and ruin by fires and other avoidable accidents.

The laboratory building now occupied is insufficient in capacity for the demands now made upon it. There are lines of work of great importance which can not be taken up. The bio-chemical side of butter and cheese making, that is, the micro-organisms which play a part in these processes and the chemical changes which are due to them, should be thoroughly studied. More work should be done with a view to the perfection of methods for the control of hog cholera and tuberculosis. The expense of such work is insignificant when we consider the vast amount of property now lost annually by our farmers through the ravages of preventable diseases.

REPORT OF THE CHIEF OF THE WEATHER BUREAU.

U. S. DEPARTMENT OF AGRICULTURE,
WEATHER BUREAU,
Washington, D. C., September 30, 1897.

SIR: I have the honor to submit a report of the operations of the Weather Bureau of the Department of Agriculture during the fiscal year that ended June 30, 1897.

Very respectfully,

WILLIS L. MOORE, *Chief.*

Hon. JAMES WILSON,
Secretary.

By way of introduction to my detailed report for the year 1896–97, I desire to submit the following comparison of the expenses and efficiency of the service during the past fiscal year as compared with those for 1883–84, when the appropriation for the weather service was the largest ever made, and to give some facts showing the necessity for a much larger appropriation in the future.

In 1883–84 the weather service cost $993,520. The extension of its scope and the increase in its usefulness since that time are matters of history. Attention is invited to a few of the important changes that have been made in recent years, particularly those showing an increase in the efficiency of the service. The appropriation for the current year is $883,772, which is $109,748 less than in 1883, while it is safe to say that the volume of work performed and the benefits derived by the public are much greater than they were in 1883.

In 1883 weather maps were not issued, except at the central office in Washington, D. C. During the last fiscal year 4,315,000 maps were issued at 81 stations outside of Washington, D. C., and there has been an increase of 1,166,105 copies within the last two years, to meet the constantly increasing demands of the public.

In 1883 forecasts and warnings were sent to 8,094 places by mail, no other methods of distribution, except through the daily press and a railroad train service, being then in use. During the last fiscal year daily forecasts and warnings were sent to 51,694 places by mail, telegraph, telephone, etc., and there has been an increase in the number of places receiving forecasts in the last two years of nearly 30,000.

In 1883 no information was collected respecting the weather as influencing crops; now climate and crop conditions are reported from about 8,000 places, and the results are summarized in the Weekly Climate and Crop Bulletins which are issued at each State center and published by practically the entire press of the country, both rural and urban. In 1883 there were less than 300 voluntary observers in cooperation with the Bureau and no systematic publication of their

reports was made; now there are about 3,000 voluntary observers making daily readings of standard Government thermometers and rain gauges, the daily readings being collated and neatly printed in tabular form at 42 State centers. These printed State reports are very useful in the development of the natural resources of the country. It is now possible for agriculturists, merchants, manufacturers, civil engineers, and health seekers to compare the salient climatic features of almost any county in one State with the conditions that may exist in another State.

In 1883 there were 41 stations on our seacoasts and the Great Lakes where storm signals were displayed for the benefit of mariners; now there are 253 stations where these signals are displayed, at each of which, in addition to displaying the signals, telegraphic bulletins, giving the location, intensity, and the probable movement of the storm, are distributed to vessel masters within one hour after the information is dictated by the forecast official at headquarters.

The appropriation for the current fiscal year is $883,772; it is inadequate to meet the demands made by the people, either directly to this Bureau or through their representatives in Congress, for a material extension of the benefits of the weather service. A conservative estimate of the money needed to meet the legitimate requests of the agricultural, marine, commercial, and manufacturing interests of the country is $1,044,050, being an increase of $160,348. This sum provides for the establishment and equipment of new stations at important centers of population, $75,000 being estimated for that specific purpose. The amount now appropriated is barely sufficient for the requirements of the actual working force at the meteorological stations, leaving no opportunity for the extension of the present system or the establishment of new stations; in fact, it is only with the utmost care and by requiring from nine to twelve hours' work every day in the year, including Sundays and holidays, of the majority of station employees that the important duties of the service can be performed. Every mail brings urgent requests from representatives in Congress, farmers, mariners, merchants, and professional people for extensions which it is impossible to grant. In the efforts to meet this public demand all workers have been taxed to the limit of physical and mental endurance.

The increase asked for also contemplates the establishing of several stations in the southwestern part of the country, where an extensive area is not now included in the domain covered by meteorological observations. This unprotected region includes large portions of Nevada, Utah, Arizona, New Mexico, and southeastern California. This region should have four or five additional stations employing one observer each. The weather conditions which cause frost in the orange and raisin sections of California drift in a southerly direction from the north and northeast. The making of the most accurate frost warnings for the extensive fruit interests of southern California requires the additional stations above referred to. Additional evidence that these stations are essential to a better service may be had in the fact that many storms which cause rain in New Mexico, Colorado, Texas, Kansas, Nebraska, and farther east, have their origin in the open and unprotected territory which it is now proposed to cover by observation stations.

Additional stations are also needed to meet the demands of many [illegible] which, although not being so geographically situated as to fur- [illegible] Bureau useful observations for the storm warnings service, [illegible] important in their manufacture [illegible] marine and other indus-

tries as to render it advisable to establish complete meteorological stations in their midst for the purpose of preserving a record of the prevailing atmospheric conditions. Such a record will be exceedingly useful in the development of their industries, and it will also be possible to effect a more prompt and systematic distribution of storm warnings and forecasts than obtains at present. There are to-day over 50 cities of more than 50,000 population having no Weather Bureau station. To be sure, some of these are contiguous to cities having Weather Bureau observatories, and do not, therefore, require a completely equipped station.

The new estimates include an item of $20,000 for the purpose of purchasing standard signal lamps for all stations displaying storm signals. A few of these lamps are now in operation at several of the more important stations. Signals at these stations may be seen at a greater distance than heretofore, thus giving a greatly improved service to shipping. Conservative estimates made by those interested in shipping indicate that one hurricane sweeping the Atlantic seaboard might cause damage to floating craft of over three millions of dollars. During the past three years ten or more of these destructive storms have visited our coast line. In every case the danger warnings have been displayed long in advance of the storm, and there have been no marine disasters of importance. There are 253 ports displaying danger signals. A recent inspection of the stations discloses the fact that the present equipment is composed of a heterogeneous assortment of lights and lanterns. The importance of a proper equipment is so great that it would be wise economy to provide each station with such a light as was, after many experiments, recently adopted as a standard by the Weather Bureau. The storm-warning service long ago outgrew the experimental stage. It has demonstrated its usefulness to such an extent that only the most efficient and permanent appliances should be used for conveying its valuable warnings to mariners.

The estimates include an item of $10,000 over and above the amount allotted for the present fiscal year, for the purpose of purchasing instrument shelters for issue to voluntary observers of the Weather Bureau, who number about 3,000 at the present time. These shelters will enable the Bureau to obtain more accurate climatic observations, since the thermometers will be so exposed as to have free circulation of air, and yet will be protected from sunlight, rainfall, and radiation from surrounding structures. Many employees are now engaged in collating and publishing these reports, for the purpose of establishing the climatic features of every portion of each State in the Union. It is an unwise economy that does not provide for the taking of accurate observations upon which so much subsequent time and labor are expended.

An item is included of $5,000 for the purpose of erecting a small brick and stone building on the Government reservation between the two canals at Sault Ste. Marie, Mich. The average number of vessels passing through these canals in the season of navigation is 80 per day. The Weather Bureau office at that point is maintained chiefly in the interests of shipping, and its location should be on this Government reservation, where it can be of the greatest service to vessel masters.

It is of great importance that offices be located with a view of securing several advantageous conditions. Nearness to the press, the telegraph office, and, if at a lake port, proximity to the harbor, are important conditions in securing prompt and effective distribution of storm

warnings and weather information. Besides providing for these, the proper exposure of meteorological instruments must not be overlooked. A flat roof, with no buildings of greater elevation in close proximity, is the best practicable city exposure. At marine ports a prominent tower visible from all parts of the harbor is necessary for the display of danger signals. Wind velocity increases and temperature decreases very rapidly with the first thousand feet of ascent from the surface of the earth; hence in securing an exposure above surrounding structures great care should be exerci ed not to locate meteorological instruments so high that their readings are not comparable with the results obtained from the stations of other cities, or so high as to show too wide a departure from readings taken within a few feet of the earth.

It is apparent that economy in expenditure should not induce the Government to locate its meteorological observatories in other than the most advantageous surroundings. Under no circumstances should the accuracy of the meteorological readings be subordinated to the desire to secure quarters rent free.

OPERATIONS OF THE YEAR ENDED JUNE 30, 1897.

The work of the Bureau during the last fiscal year was conducted on lines tested and approved by the experience of former years. There was no relaxation in the efforts to improve the methods of administration, and to make the service of the greatest good to the largest number of people.

Forecasts.—The usual forecasts of temperature, wind, and weather were issued twice daily, as were also special warnings of cold waves, frosts, severe storms, and hurricanes, as occasion demanded.

One storm, of a very destructive nature, passed across the eastern border of the United States since the date of last report. This storm, the coming of which was foretold on the evening of September 27, 1896, struck the coast of Florida in the vicinity of Cedar Keys on the morning of September 29, and passed rapidly northward to the region of the lower lakes by the morning of the 30th.

The force of the wind was so great in many localities that human foresight could not avail in preventing the loss of life and property. The remarkable feature of the storm was the violence manifested throughout the Middle Atlantic States. Sixteen lives were lost in Virginia, District of Columbia, Maryland, and Pennsylvania; 98 in Florida, Georgia, and South Carolina. The loss of property was estimated at $7,000,000.

The passage of a West India hurricane through the center of the populous districts of the Middle States is not wholly new in the annals of meteorology, yet it is seldom that one of such violence takes a course so far inland. The lesson of it all, especially for architects and structural engineers, is that violent winds during the hurricane season must [illegible] included with[illegible] the categ[illegible] their probabilities as fa[illegible] inland [illegible] the eighty-fift[illegible] meridia[illegible]

[illegible] hurricane [illegible] occasion[illegible] during the [illegible] ns o[illegible] one[illegible] [illegible] violen[illegible] orms of [illegible]

[illegible] service [illegible] has been [illegible] during the sev[illegible] re storms that at [illegible] hat occasionally

sweep from the Rocky Mountains eastward, rather than the ordinary changes in temperature, wind, and weather.

The official in charge of the New York office, in reporting upon the severe storm of December 15, 16, 1896, says:

After the issue of the hurricane warning not a vessel was reported to have left port, except the steamship *St. Louis*, of the American Line, and it is believed that she came to anchor off Sandy Hook Bar. The storm was very severe in this section and was attended by all the most dangerous features of such storms; the wind blew a gale (54 miles per hour) on shore from the northeast, with fine sleet, heavy driving snow, and temperature below freezing. It is seldom that the mariner encounters such a combination of dangers. All vessels prepared for the storm, and, in view of the timely warning, there was a chance for all to seek a harbor of safety. It is marvelous that not a vessel of any class was lost or even disabled in this section.

The official in charge at Boston reports concerning the hurricane warning of October 10, 1896:

This was the most marked success of the year. The information of the approach of one of the most destructive and protracted storms of recent years was very timely. Vessels of all classes were tied up and shipping was practically suspended from October 10 to 16, inclusive. The saving of property in this instance was enormous, exceeding many times the cost of the maintenance of the entire Weather Bureau for years. The press of this city commended the Bureau in the highest terms for its good work, and placed the value of shipping saved by the warning at millions of dollars, which was of little importance compared with the saving of human life.

The above comments, it may be urged, necessarily partake more or less of the nature of ex parte testimony. Granting this, there is still an abundance of testimony from the standpoint of the people in general, as witness the following from the editorial columns of the Jacksonville (Fla.) Daily Times-Union of September 6, 1897:

THE SEASON OF HURRICANES.

Shipmasters at this the season of West India hurricanes should watch with more than usual care the forecasts of the Weather Bureau, and should take no chances when low or cyclonic areas are reported in the Gulf. For five successive years Florida has not escaped from having one or two hurricanes, with a wind velocity of from 45 to 80 miles an hour. In preceding years they pursued a course either to the eastward or the westward of the State, but in all instances doing great damage to shipping. In fact, the men who go down to the sea in ships have found the latter part of August, the whole of September, and the first part of October to be the most perilous period of the year, but the increased efficiency of the Weather Bureau, due to more numerous stations, better appliances for observation, quick means of communication, and particularly careful study of this enemy of shipping, has lessened these perils in a great degree, so that a shipmaster of intelligence and caution should now, in coastwise voyages, know in a general way just about the weather he will encounter from port to port.

Flood warnings.—The warnings issued by the Bureau in connection with the disastrous floods that occurred in the Lower Mississippi Valley in the spring of 1897 were most timely and effective. The daily forecasts issued by the officials in charge of the river centers gave timely notice of the gradual rise of rivers to the danger line, and as soon as it was seen that floods were imminent, warnings to that effect were sent from the central office in Washington, D. C. Thus, on March 15, two weeks before the first serious break in the levees, it was announced in a special bulletin that—

The reports indicate a continued rise in the Lower Mississippi River during the next ten days or two weeks, and from the water now in sight and rainfall likely to occur within the next few days it is probable that the impending flood will

prove very destructive in Arkansas and northern Louisiana. The most destructive overflow is likely to occur between the mouth of the Arkansas and the mouth of the Red River, and the observers of the Weather Bureau in that region have been directed to warn the public generally of approaching danger.

Again, on March 19, it was announced that—

The floods in the Lower Mississippi during the next ten days or two weeks will, in many places, equal or exceed in magnitude and destructiveness those of any previous years, and additional warning is given to residents of the threatened districts in Arkansas, Louisiana, and western Mississippi to remove from the region of danger.

As the flood approached its height these warnings were repeated and emphasized, notably so on March 28, April 3, 15, and 17. The local officials, under instructions from the central office, gave the widest possible distribution to these warnings, by mail and telegraph, throughout the threatened regions; a daily bulletin was also given to the press, thus keeping the public thoroughly informed of the present and prospective extent of the flood. Through the courtesy of Mr. John Hyde, Statistician of the Department of Agriculture, I am able to submit a rough estimate of the values of live stock and farm products on hand in the flooded districts of the Mississippi River immediately preceding the flood, which are as follows:

January 1, 1897, horses, cattle, sheep, and other live stock	$10,037,540
March 1, 1897, corn, oats, cotton, and other movable farm products of last year's crop	4,664,900
Total	14,702,440

It would be impossible to estimate the value of live stock and movable property saved by these warnings, but certainly the saving amounted to many millions.

At a time when the Mississippi River at New Orleans was at the highest stage ever known, warnings were sent to that city that within five days the gauge reading would show a further increase in the height of the water of over 1 foot; that it was imperative that the height of the levees be still further increased.

The water reached the height predicted exactly on the date specified in the warnings, but the levees had been strengthened and raised to meet the impending danger.

At Cairo the river rose to danger line on February 26, and remained above it for fifty-nine days. Danger line was reached at Memphis on March 10, at Vicksburg on March 16, at New Orleans on March 18. The duration of the flood at these points was as follows: At Memphis, fifty-three days; at Vicksburg, eighty days; at New Orleans, eighty-eight days. The highest water ever known was experienced at Memphis and points below.

On April 5 the Secretary of Agriculture directed the Bureau to prepare a map, showing the area then under water, at the earliest possible moment. By a free use of the telegraph, such a map was completed at 3.30 p. m. of the following day, and was of fair accuracy, as shown by subsequent detailed reports. A full report of this flood together with a review of previous floods and a discussion of normal rainfall and drainage in the Mississippi basin, is in preparation for early issue.

Hydrography.—There have been maintained during the year 113 [illegible] stations making daily observations and full [illegible] together with such telegraphic reports as have [illegible] forecasting. In addition

special reports are received at times of heavy rainfall and high water from 33 other stations. Voluntary river observations are also made by and reports received from a considerable number of unpaid observers.

The system of river and rainfall stations was revised at the end of the past year, such changes as were made going into effect on July 1, 1897. It was sought in this revision to secure a greater number of continuous records throughout the year. Such a course was necessary, as without continuous records the regimen of the streams could not be correctly determined. To do this without much increase of expense, some of the less important stations were closed.

Beginning with the issue of the Monthly Weather Review for November, 1896, there has been included in that publication a monthly report on the condition of the rivers of the United States, accompanied by a table of average and extreme gauge readings and range in the river stages at the various river stations. Since April 1, 1897, this has been supplemented by a hydrographic chart for selected stations on seven more important rivers. This feature of the Weather Review furnishes the only means in the country of obtaining current river data from all sections.

Part V of the series of Daily River Stages, published by the Weather Bureau, was issued near the end of the year. This volume embraces daily stages at all stations for the years 1893, 1894, and 1895. A companion volume of daily rainfalls for the same years is in press.

The river service is composed of 22 sections, each with a central office receiving reports from a definite area and each making local forecasts for the river district under its supervision. In the case of impending great disaster, the central office at Washington dictates the important warnings for distribution by the section centers.

As yet the rules of flood forecasting are largely empirical. The official in charge of a river center is familiar with the main river and its tributaries; the area and topography of the catchment basin; the frequency and intensity of the rainfall, especially the intensity; the average time of passage of flood crest between one station and another, and the history of past floods. The knowledge of low-water conditions, especially where bars and shoals exist, is perhaps of equally great importance as the knowledge of high water. The people living in regions contiguous to navigable streams are materially affected in their industries by the conditions of navigation, and the Weather Bureau in giving fairly accurate predictions of variations in low-water stages, as well as in giving warning of destructive floods, renders a signal benefit to river shipping. The official in charge of a river center makes timely dissemination of warnings when floods threaten.

During recent years a very thorough reorganization and systematization of the river and flood service has been effected. From the local observers who measure the rainfall or gauge the river heights to the trained meteorologists who are in charge of the river centers; from the latter officials to the forecast officers at the central office; and from these to the Chief of Bureau, the organization has been slowly strengthened, until it is believed the Bureau is able to efficiently serve the public during an emergency.

Cold wave and frost warnings.—The year was somewhat remarkable for the absence of severe cold waves and destructive frosts, but such as occurred were, as a rule, accurately forecast in good season. A system of reporting the advance of cold waves from station to station (reports being sent by the stations affected to those nearest and in the probable path of the cold wave) was put in operation during

the year over the eastern Rocky Mountain slope from Nebraska to Texas, on the recommendation of Lieut. Col. H. H. C. Dunwoody, U. S. A., who is assigned to duty with the Weather Bureau as supervising forecast official. In this, as in many other instances, Colonel Dunwoody has shown his fitness as an able assistant to the Chief of Bureau.

Gratifying success attended the warnings issued for the benefit of the fruit industry of Florida, the sugar interests of Louisiana and Texas, and the truck-growing districts of the eastern seaboard.

The rain warnings issued from the San Francisco office for the benefit of the raisin industry during the drying season, and on the accuracy of which that industry is greatly dependent for success, were in every instance justified. The official in charge of the San Francisco office states, in reference to the work of the Bureau in this particular, that during the last three years not a single rain occurred in the raisin-drying region without warning, and in only one instance was an unnecessary warning issued.

Distribution of forecasts and warnings.—The distribution of forecasts and warnings has been continued on practically the same lines as in former years, particular attention having been given to the development of the system of mail distribution by logotype cards in the large cities.

The number of forecasts and special warnings distributed in each State and Territory, not including those contained in the daily press reports and weather maps, is shown in the table below:

Number of forecasts and special warnings distributed.

States and Territories.	By telegraph or telephone at Government expense.			Without expense to the United States, by—				Total.
	Daily forecasts.	Cold wave and frost.	Emergency.	Mail.	Telegraph or telephone.	Railroad telegraph.	Railroad train service.	
Alabama	22		63	569	6	26	12	698
Arizona	3				8			11
Arkansas	40	4	58	289	26	7		424
California	108	7	3	1,219	93	349		1,779
Colorado	11	10	47	396		6	7	477
Connecticut	13	6	32	525	49	16	151	792
Delaware	5		6	33		21		65
District of Columbia				830	13			843
Florida	44	42	32	377	2	68		585
Georgia	51	40	82	571	2	99	41	886
Idaho	9			174	1			184
Illinois	67	25	383	2,108	5	308	459	3,355
Indiana	91	2	98	1,134	1	194	287	1,807
Indian Territory	7	1		103	1			112
Iowa	107	5	83	1,089	38	11		1,433
Kansas	40	3	42	434	20	37	8	684
Kentucky	44	6	76	564	116	25		891
Louisiana	25	2	[illegible]	412	10	1		485
Maine	[illegible]		[illegible]	861	[illegible]	17	17	942
Maryland	[illegible]	[illegible]	7	321	[illegible]	100		497
Massachusetts	2	6	32	1,818	2		331	2,241
Michigan	[illegible]	[illegible]	67	2,648	35	309	457	3,706
Minnesota	[illegible]	1	[illegible]	1,063	4	7		1,270
Mississippi	[illegible]	[illegible]	[illegible]	200	5	9		384
Missouri	[illegible]		[illegible]	3,150	[illegible]	107	60	3,691
Montana			[illegible]	22				57
Nebraska	[illegible]			775		11		1,004
Nevada				49				55
New Hampshire			[illegible]	275		9	31	340
New Jersey	[illegible]	[illegible]	[illegible]	785	[illegible]	160		1,087
New Mexico			[illegible]	23	[illegible]	4		36
New York		[illegible]	[illegible]	3,606	[illegible]	256	61	4,540
North Carolina	[illegible]	[illegible]	14	587	7	1	16	808
North Dakota	[illegible]	[illegible]	6		5			169
Ohio	[illegible]	[illegible]	[illegible]	[illegible]	8	8	17	3,997
[illegible]	[illegible]		[illegible]	[illegible]	[illegible]			68

Number of forecasts, etc., distributed—Continued.

States and Territories.	By telegraph or telephone at Government expense.			Without expense to the United States, by—				Total.
	Daily forecasts.	Cold wave and frost.	Emergency.	Mail.	Telegraph or telephone.	Railroad telegraph.	Railroad train service.	
Oregon	22			610	9		104	745
Pennsylvania	64	13	105	1,557	712	705	7	3,163
Rhode Island	2		5	21			27	55
South Carolina	53	4	65	497	62	42	10	733
South Dakota	42	31	76	355	12			516
Tennessee	34	4	93	833	64	31	2	1,061
Texas	51	31	184	499	140	64		969
Utah	13			134				147
Vermont	11	1	16	464	13	11	13	529
Virginia	39	11	91	750	105	75	95	1,166
Washington	25	2		359	24		29	439
West Virginia	17	9	44	249	8	32		359
Wisconsin	55	13	134	1,132	37		16	1,387
Wyoming	3	5	6	5	3			22
Total	1,886	613	3,481	37,913	2,347	3,196	2,258	51,694
June 30, 1896	1,581	598	3,481	22,642	1,712	3,550	1,939	35,501
Increase	305	15	00	15,271	635		319	16,193
Decrease						354		

Distribution of weather statistics by maps.—Detailed information of the actual weather conditions existing over considerable areas is graphically shown by the daily weather maps, the circulation of which increased more than three-fourths of a million copies during the year, the total issue being 4,625,250 copies. Business houses, public offices, and schools are the principal recipients of the maps. The extension of the improved system of printing adopted last year has made this large increase possible. There are at present 81 map-printing stations, at 27 of which an improved printing process is in use. In addition to these there are 21 stations where meteorological bulletins containing weather data in tabular form are issued.

CLIMATIC WORK.

Aside from the issuance of daily forecasts and special warnings the Weather Bureau is charged by law with the reporting of temperature and rainfall conditions in the cotton, corn, and wheat regions; the gauging and reporting of rivers, and other matters.

The cotton-region service covers the Southern States from the Carolinas, Georgia, and Florida westward to Texas. Observations of the temperature and rainfall are made at 129 stations throughout this region.

The corn and wheat region service extends from Michigan, Ohio, and Kentucky westward to and including the Dakotas, Nebraska, and Kansas, in which territory 132 daily reports are made at as many stations.

The climatic statistics collected from cotton, corn, and wheat region stations are conveyed to the general public, for whose information they are obtained, chiefly through the medium of the daily press and by telegraphic reports that are bulletined in the principal grain and produce exchanges of the country.

PUBLICATIONS.

The texts, charts, and statistical matter required in the presentment of the various phases of climate and weather are prepared and

printed at the central office. The work involved in this connection is varied, and, in some cases, of exceptional character. No material change has been made in the organization of the various divisions having charge of the collection and discussion of climatological data, or in the character of the publications issued, a list of which appears below:

Title.	When issued.	Edition.
1. Daily Weather Map	Daily	850
2. Weekly Climate and Crop Bulletin	Tuesdays, April to October	5,000
3. Weekly Snow and Ice Chart	Mondays, during cold season	800
4. Monthly Climate and Crop Bulletin	October to March	5,000
5. Monthly Weather Review	15th of each month	3,800

Monthly Weather Review.—The scope of the Monthly Weather Review has been enlarged and its usefulness increased through the untiring efforts of its editor, Prof. Cleveland Abbe. It should be noted that Professor Abbe was one of the most active of those who, thirty years ago, advocated a Government weather service. In 1869, with the aid of the Cincinnati Chamber of Commerce and the Western Union Telegraph Company, he collected observations by telegraph and issued daily forecasts. In 1870, when Congress authorized the War Department to establish a tentative weather service, he was engaged to assist Gen. A. J. Myer in laying the foundation of that which has grown to be the present extensive weather service of the Agricultural Department. Possessing a profound knowledge of the mathematics, the physics, and the literature of meteorology, he has been a modest, loyal, and valuable assistant to the several executive heads of the service. He was the first and is still the senior professor of meteorology. I regret to report that to-day the Government, in whose service he has spent twenty-seven years of his earnest life, now pays him but two-thirds of the salary he received on entering its service. At an early day I hope to see his salary restored to, say, $4,000 per annum. He has edited the Monthly Weather Review in such manner as to command the admiration of both American and European scientists. Quotations from it are to be found daily in the popular scientific journals of this country and of the world.

Although the majority of the articles in the Review are of an elementary and popular character, such as are suited to the needs of teachers and students of all grades, except in the higher colleges, yet a large number of its readers, on the other hand, would appreciate strictly technical articles, and it is proposed to hereafter consider the needs of these readers.

It is now some years since charts of normal pressure at sea level and normal surface isotherms were published in the Review. The subsequent accumulation of data has been reduced in the Records Division, and it is proposed to publish greatly improved charts of normals and extremes in the Review during the coming year.

The prediction of the weather is, to a considerable extent, condi- [illegible] on the extent of the area from which telegraphic reports are [illegible] This may also be found to be true when we consider the [illegible] ing long-range seasonal predictions. A forecast of [illegible] ver of the weather for the whole of any month must [illegible] into consi[illegible] ion the meteorological conditions over a very large [illegible] the glob[illegible] The atmosphere must [illegible] studied as a unit, and to

this effect, on the one hand, the principles of mechanics that apply to it must be set forth in terse formulæ, while, on the other hand, the meteorological statistics must be presented for the whole globe in a similar manner, such that the complex mechanical interactions may, as far as possible, be worked out graphically. It is proposed to publish in the Monthly Weather Review during the next two years a number of contributions to this general study of the whole atmosphere. Several purely mathematical papers are available, beginning with one by Mr. Joseph Cottier. This will be followed in due season by charts of the sea-level and upper-level isobars, isotherms, and winds, and by the results of the study of cloud heights and motions, upon which latter work Prof. F. H. Bigelow is now engaged.

The prompt publication of these results will greatly stimulate progress in knowledge.

The new work in contemplation will probably add four charts on the average to each Monthly Weather Review and will increase the letter press by two pages of text and two of tabular matter.

ORIGINAL INVESTIGATIONS AND REPORTS.

Climatology.—The general character of the investigations conducted during the fiscal year under the subhead "Climatology" embodied researches along the following lines:

1. The study of such statistics as were accessible and available in connection with the climatic and seasonal distribution of the meteorological conditions prevalent at the inception, increase, and abatement of sickness and mortality, the purpose of such study being to determine whether there is such a persistent association of certain climatic or meteorological conditions with any of the phases of sickness and mortality as to afford reasonable ground for the belief that the relation is in any manner one of cause and effect.
2. Such investigation as it might appear practicable to make relative to the demands made by meteorological conditions upon the heat-producing powers of the animal body.
3. Such investigations as it might appear practicable to make relative to the influence of meteorological conditions upon the vital activity of pathogenic bacteria.

Some progress has been made along all three of the above indicated lines of research.

Along the first line, statistical studies have been conducted with reference to the influence of climate, season, and weather upon sunstroke and pneumonia. Along the second line, considerable attention has been given to devising some special apparatus which should approximate, as nearly as practicable, the thermic conditions of the human body, and with which it might be feasible to obtain an instrumental approximation of the demands made by the general weather conditions upon the heat-producing powers of the human body; also, some experiments have been made to obtain a more or less concrete idea of the relation of the general meteorological conditions to the protective efficiency of clothing, as judged by the temperature between the different layers of clothing, while along the third line of study much thought has been given to planning some feasible methods of experimentation. Considerably more time will be required before it will be possible to give more definite details regarding the greater part of the matters that have so far been investigated.

The subjects of sunstroke and the influence of the general weather

conditions upon the efficiency of clothing have formed topics of preliminary papers contributed to the Monthly Weather Review (November and December, 1896, and May, 1897) by Dr. W. F. R. Phillips, in charge of the section on climatology. It is hoped that more complete reports can be made upon these two subjects.

The study made by Dr. Phillips of the meteorological conditions associated with the occurrence of sunstroke, particularly those which obtained during August, 1896, has apparently given some information that may be of importance concerning this class of morbid phenomena.

From trustworthy information received in response to a circular sent out August 20, 1896, it appeared that 2,038 deaths occurred during that month which were directly attributed to sunstroke, as the term is ordinarily used and accepted. Although this number of deaths was unusually large, there was reason to suppose that the actual number of fatalities from the intense heat was much larger; and accepting the usually stated ratio of cases and deaths, the number of persons that must have suffered in greater or less degree was something enormous. In 841 cases of sunstroke, the clinical histories of which were obtained with more or less exactness, the fatality was 16.6 per cent, and were this rate assumed as the index of fatality that obtained in general during August, 1896, the 2,038 deaths would have represented the occurrence of 12,277 cases of sunstroke of varying severity.

From a comparative study of the sunstrokes and the weather prevalent during their occurrence, the following conclusions regarding the relation and influence of the meteorological conditions were reached:

(*a*) That the number of sunstrokes followed more closely the excess of the temperature above the normal than it did that of any other meteorological condition.

(*b*) That the number of sunstrokes did not appear to sustain any specific relation to the relative humidity.

(*c*) That although the absolute humidity was greatest during the maximum of sunstrokes, yet it did not appear that its variation influenced the number of cases.

(*d*) That the other recorded meteorological conditions—i. e., the atmospheric pressure, wind, rain, and state of weather—did not show any features that could be regarded as of etiological significance.

Inasmuch as there appeared to be a closer association between the course of the sunstroke and the course of the atmospheric temperature than between any other meteorological element or condition, an attempt was made to ascertain, if possible, what degree of temperature was necessary or most likely to excite sunstroke. An examination of the different statistics appeared to show that there was empirical evidence for assuming that each locality had for its acclimated inhabitants a particular sunstroke temperature or range of temperature, and for adopting as a provisional index of the sunstroke temperature the normal daily maximum temperature of each climate. This [illegible] provisional standard applied to the cases of sunstroke as reported [illegible] New York [illegible] Philadelphia and Washington, from [illegible] statist[illegible] the following [illegible] occurred with daily mean [illegible] ightly above the normal maximum [illegible] period in question). In Boston [illegible] Washington 77 per cent of the [illegible] temperature.

In the light of these results the following working hypothesis was proposed: Sunstroke becomes imminent during the summer months when the mean temperature of any one day or of several successive days becomes equal or nearly equal to the normal maximum temperature for the period.

Also, an attempt was made to determine, by using such statistics as were accessible for other years, how far the hypothesis above stated could be depended upon as a criterion of impending danger from sunstroke, with the result that it appeared to be a fairly good index for the eastern and central portions of the United States. No statistics were accessible for the States of the western plateaus. But, with respect to the above hypothesis, this caution is to be kept in mind: That although the hypothesis embodies certain plausible climatological conditions, it was evolved simply as an empiricism based upon quite a large number of facts, and that it does not rest upon a satisfactory knowledge of all the factors involved, and that even before it can be said to represent accurately an empirical relation it must be corroborated by a larger mass of statistics than are at present accessible.

The rainfall of the United States.—The results of a study of the rainfall registers of the United States by Mr. Alfred J. Henry, with especial reference to the period 1871–1896, will shortly appear as Bulletin D of the Weather Bureau, from which the following facts and conclusions are drawn:

Observations of the rainfall in this country have been made at irregular intervals since 1738. In recent years the number of rain stations has been greatly increased, chiefly through the efforts of voluntary observers and private individuals interested in climatic research. While the material at hand is much greater than ever before, the lack of continuity in the registers of private persons is a most serious defect. Probably less than 2 per cent of the available registers extend over twenty consecutive years, too short a period to determine the true normal precipitation.

The amount of rain that falls in any region, on the average, depends largely upon its geographic position with reference to (*a*) the ocean or other large body of water and (*b*) to the average path of atmospheric disturbances.

The annual fluctuations of the rainfall of the United States during the ten years 1887–1896 are shown by the numerical value of Table I. The figures in the table represent the difference between the actual and the normal rainfall of each geographic district, plus (+) indicating the excess, in inches and tenths, and minus (—) the deficit. The figures "+2.4" for New England, 1887, were obtained by computing separately the departure from the normal of the rainfall at each of the 9 stations comprised within that district. The separate departures were added algebraically and the sum divided by the number of stations in the district, in the case of New England, 9. This operation gave the average departure for the district, viz, + 2.4 inches.

Departures from the normal precipitation by geographic districts (1887–1896).

[Inches and tenths.]

Districts.	No. of stations.	1887.	1888.	1889.	1890.	1891.	1892.	1893.	1894.	1895.	1896.
New England	9	+ 2.4	+10.1	+ 5.2	+ 5.8	+ 0.3	− 4.3	− 0.8	− 7.5	− 2.8	− 5.0
Middle Atlantic States	11	− 1.0	+ 4.7	+12.5	+ 5.4	+ 4.5	− 2.3	+ 2.9	− 2.5	− 7.6	− 7.2
South Atlantic States	11	− 1.5	+ 0.2	+ 2.0	− 5.0	− 1.7	− 7.4	+ 1.5	− 2.0	− 1.5	−10.7
East Gulf States	5	− 6.0	+ 7.2	− 6.7	− 5.0	− 0.2	− 7.0	− 1.2	− 6.9	− 6.4	− 9.0
West Gulf States	8	− 6.1	+ 8.3	− 2.2	+ 2.1	− 9.0	− 3.8	− 9.3	− 4.6	− 3.6	−12.5
Ohio Val. and Tenn	11	− 4.2	+ 1.9	− 4.3	+ 9.2	+ 0.3	− 1.9	− 2.6	− 8.9	−11.6	− 4.6
Lower Lake Region	8	− 3.9	− 4.8	− 2.4	+ 5.2	− 3.6	+ 3.8	− 0.3	− 3.8	− 5.5	+ 0.1
Upper Lake Region	10	− 3.1	− 5.0	− 3.6	− 0.1	− 2.4	− 0.8	+ 0.7	− 2.8	− 5.4	− 4.6
Extreme Northwest	4	− 1.0	− 2.9	− 6.3	− 0.4	+ 3.9	− 1.0	− 0.9	− 0.4	− 1.1	+ 2.9
Upper Mississippi Val	13	− 4.9	− 0.6	− 6.1	+ 0.1	− 5.1	+ 4.7	− 3.4	− 8.7	− 9.2	+ 0.5
Missouri Valley	10	− 2.2	− 2.3	− 4.1	− 4.1	+ 0.9	+ 2.0	− 2.1	− 8.0	− 0.6	+ 0.2
Northern Slope	6	+ 1.1	0.0	− 2.4	− 2.7	+ 4.5	+ 1.8	− 1.8	− 1.2	− 1.0	+ 0.9
Middle Slope	7	− 4.2	− 4.5	− 0.3	− 4.2	+ 6.0	+ 1.8	− 5.4	− 5.1	+ 0.6	− 1.8
Southern Slope	4	+ 1.3	+ 3.7	− 2.4	+ 1.8	− 0.8	+ 2.2	− 5.2	− 3.4	+ 4.0	+ 1.0
Southern Plateau	9	+ 0.9	+ 0.2	− 1.4	+ 1.0	− 2.1	− 4.7	− 1.7	− 2.7	+ 0.2	+ 1.1
Middle Plateau	5	− 3.9	− 1.7	+ 1.9	− 0.4	+ 2.0	− 0.6	+ 0.4	+ 0.7	− 2.8	+ 2.4
Northern Plateau	4	− 2.1	− 4.5	− 4.1	− 4.1	− 0.8	0.0	+ 6.2	+ 3.2	− 3.0	+ 1.1
North Pacific Coast	8	− 6.2	− 6.6	−10.6	− 9.0	+ 8.4	− 3.0	+13.3	+11.8	+ 5.8	+10.1
California	12	− 5.6	− 1.8	+11.4	+ 1.9	− 3.4	+ 4.4	+ 1.0	+ 0.6	− 1.1	+ 1.0
Above the mean	....	4	8	5	9	9	7	7	4	4	11
Below the mean	....	15	10	14	10	10	11	12	15	15	8

A cursory examination of the table shows that there has been a very general deficiency of rain in the majority of years and in almost all of the districts. Moreover, there does not seem to be any law of compensation by which a deficit in one district is balanced by a surplus in another. The South Atlantic and Gulf States, in particular, show a marked deficit throughout almost the entire period. This fact naturally suggested an inquiry into the rainfall of the preceding ten years. The following statement shows the average precipitation at the principal Weather Bureau stations in the region just mentioned for twenty consecutive years, in periods of ten years each:

Average annual precipitation in periods of ten consecutive years, 1877–1886 and 1887–1896.

[Inches and hundredths.]

Stations.	1877–1896.	1877–1886.	1887–1896.	Difference.
Lenoir, N. C	50.09	51.40	48.78	− 2.62
Hatteras, N. C	65.58	73.41	57.76	−15.65
Wilmington, N. C	53.06	58.83	47.30	−11.53
Charleston, S. C	54.59	56.82	52.37	− 4.45
Augusta, Ga	46.99	46.53	47.44	+ 0.91
Savannah, Ga	49.83	50.91	48.75	− 2.16
Jacksonville, Fla	53.40	57.69	49.12	− 8.57
Mobile, Ala	62.67	66.61	58.73	− 7.88
Montgomery, Ala	50.97	52.04	49.90	− 2.14
Vicksburg, Miss	54.37	62.04	46.69	−15.35
Memphis, Tenn	52.77	56.76	48.78	− 7.98
New Orleans, La	58.81	61.34	54.28	− 7.06
Shreveport, La	47.34	54.26	40.42	−13.44
Galveston, Tex	46.18	52.40	39.96	−12.44

The [illegible] above may be viewed from either of two standpoints, viz: (1) Either the rainfall of the first period was abnormally high and the apparent decrease in the second period is merely a return to normal conditions, or (2) there has been a permanent decrease in the rainfall. The first proposition seems to be the more rational one.

The heavy rainfall on the Texas coast, where there is a marked deficiency, is largely due to the advent of cyclonic storms from the Gulf, which often have a very slow movement and give torrential rainfall for several days in succession. Thus, 8.70 inches fell on September 16–17, 1877; 8.40 inches on October 24, 1877; 8.24 inches on September 3–4, 1885; 16.53 inches on September 15–20, 1885. In the last-named case the rainfall at points less than 100 miles inland was not a fifth of the fall at Galveston on the coast. The movement of these storms, after passing several hundred miles northward, is much accelerated, and less rain is precipitated than on and near the coast.

The seaward margin of the South Atlantic States is in the region of West India hurricanes, and naturally receives a greater amount of rainfall in years when these storms are prevalent. While these facts may partially explain the marked variation in the rainfall of individual years, they by no means fully account for the phenomenon.

The variation between the rainfall of the 10-year periods, as shown by the above table, was not so marked elsewhere in the United States, although the fall of the second period was generally below that of the first.

It was not possible to extend the comparison to earlier periods, except for portions of the older States, as New England, the Ohio Valley, and the middle Mississippi Valley. Here no positive evidence of a periodicity was obtained, although some sixty years of continuous observations were examined.

Rainfall of the crop season.—The exact amount of rainfall required for the successful cultivation of crops has not been fixed nor can be in terms of rainfall alone. On the Pacific Coast and over comparatively small areas in the arid regions wheat and other cereals are grown with a seasonal rainfall considerably less than 15 inches; but it should be remembered that the climatic conditions as regards temperature and humidity are somewhat different from those which obtain in the wheat region of the Northwest. The character of the soil, especially as regards its ability to retain moisture, is a very important consideration. It is said, in explanation of the fact that wheat is grown in eastern Washington, where the yearly fall is generally under 18 inches, that the rainfall of winter and early spring is conserved in the soil, and is supplied to the plant by capillary action during the early part of the growing season.

The average rainfall of Spokane, in the wheat region of eastern Washington, during April, May, and June, is but 4.5 inches, or about as much as falls in a single month in the wheat regions of the Mississippi Valley. It is quite obvious that the growth of the plant is not due to the rainfall of the spring and early summer months alone.

A comparison of the seasonal precipitation chart (not here reproduced) with the returns of the Eleventh Census confirms the view above expressed, viz, that the area adapted to the cultivation of cereals can be broadly defined by the line of 15 inches, or nearly that amount, of rain per season, although no hard and fast rule can be laid down. The valley of the Red River of the North, in Minnesota and North Dakota, is widely known as a famous wheat-producing region, yet the seasonal rainfall is a little under 15 inches from St. Vincent northward.

The area included within the line of 15 inches and over of rain per crop season is practically coextensive with the territory east of the one hundredth meridian. The lower Missouri, middle and upper

Mississippi, and the Ohio valleys, the Middle States, and New England, however, receive on the average 20 inches and over of rain during the crop season.

The least amount of rain that ever falls during the growing season, April to September, varies from about 22 inches in central Florida to 10 inches on the Lower Lakes, and from about 15 inches at the mouth of the Mississippi to about 8 inches in northern Minnesota.

The years of minimum rainfall or drought, from 1871 to 1896, fall in groups separated by irregular time intervals. The first group centers about 1871; the second, 1881; the third, 1887; and the last, 1894–95. The drought of 1887 was severe in some months, but not consistently so throughout the entire season. The droughts of 1881 and 1894 were widespread and severe. The former was confined principally to the States east of the Alleghanies, while the latter was felt from Nebraska eastward to Massachusetts and southward to Alabama. Prior to 1870 the few records available indicate a severe drought in Kansas and western Missouri in 1860, more severe than has since been experienced. Widespread drought in the central valleys and lake region was noted in 1863. The periods of extensive drought in chronological order are, therefore, 1860, 1863, 1870–71, 1881, 1887, and 1894–95. There have been, of course, severe local droughts in various portions of the United States during the intervening years, as there must always be in a territory of such vast extent.

The table below was prepared to illustrate the fact that generally the least rainfall may be expected to occur within a period of twenty-five years. The second column of the table shows the least rainfall of the crop season during the twenty-six years 1871–1896, and the third column the least ever recorded in previous years.

In nine of the sixteen cases the year of least rainfall occurred prior to 1870, but the differences in individual cases are not great and disappear altogether in the general average of both periods.

Least rainfall, April to September, inclusive, at the stations named.

[Inches and tenths.]

Stations.	1871–1896.	Previous years.	Remarks.
New Bedford, Mass	13.2 in 1891	11.6 in 1849	Continuous record from 1814.
Boston, Mass	13.9 in 1887	11.8 in 1836	Continuous record from 1818.
Providence, R. I	16.3 in 1894	11.3 in 1836	Continuous record from 1832.
Amherst, Mass	13.9 in 1887	11.8 in 1836	Continuous record from 1836.
New York, N. Y	12.7 in 1881	12.5 in 1849	Continuous record from 1836.
Newark, N. J	12.1 in 1881	16.4 in 1845	Continuous record from 1844.
Philadelphia, Pa	10.3 in 1881	14.5 in 1825	Continuous record from 1825.
Washington, D. C	14.3 in 1894	16.7 in 1869	Continuous record from 1856.
Savannah, Ga	19.0 in 1881	*20.8 in 1857	Continuous record from 1837.
Portsmouth, Ohio	12.8 in 1878	†9.7 in 1834	Continuous record from 1830.
Cincinnati, Ohio	12.6 in 1895	11.9 in 1870	Continuous record from 1835.
Louisville, Ky	14.6 in 1881	‡15.4 in 1856	Continuous record from 1842.
St. Louis, Mo	10.7 in 1871	15.8 in 1870	Continuous record from 1837.
Miami, M[illegible]	13.3 in 1871	8.1 in 1860	Continuous record from 1847.
Monticel[illegible] owr	10.2 in 1871	12.4 in 1863	Continuous record from 1855.
[illegible]	11.1 in 1875	9.7 in 1860	Continuous record from 1854.
	13.2	13.2	

[illegible] missing.

[illegible] request of the [illegible] stations [illegible] on Congress, the fifth annual session [illegible] Ariz., December 15–17, 1896, a report [illegible] of the arid and subarid [illegible]

Opportunity was taken to present the salient features of the temperature of evaporation, popularly known as the sensible temperature, of this vast region. As has been elsewhere stated, the sensation o heat, which is usually referred to atmospheric conditions, depends not only on the temperature of the air, but also upon its dryness, the velocity of the wind, and other circumstances. It was shown in the report that the high temperatures of the Southwest were mitigated in no small degree by the prevailing dryness of the atmosphere and the clearness of the sky, the latter tending to promote terrestrial radiation—an effective means of lowering the temperature of the night-time.

The southwestern part of the United States possesses a climate intermediate between that of the tropics and the temperate zones. The sequence of weather is more uniform than in higher latitudes; the changes in temperature from day to day are less; rainfall is deficient; the sky is generally clear; insolation and radiation are both strong; the range of temperature from day to night is large, from 25° to 35°; the winds are generally light and evaporation is high.

The concluding part of the report deals with the strength of the surface winds over the arid region and the time such winds are available for driving windmills. It is shown that on the plains east of the Rocky Mountains effective winds (6 to 20 miles per hour) prevail about 50 per cent of the time; that on the eastern foothills of the Rocky Mountains and in sheltered valleys effective winds could not be depended upon more than 30 per cent of the time when irrigation is most needed.

In the Great Basin, Arizona, and New Mexico, effective winds prevail from 30 to 50 per cent of the time, depending somewhat upon the nature of the land surface and the immediate environment of the wind motor.

Storms, storm tracks, and weather forecasting.—There was prepared and issued during the year Bulletin No. 20, Storms, Storm Tracks, and Weather Forecasting, by Prof. Frank H. Bigelow. The purpose of the bulletin was to create a more intelligent interest in the daily weather map, and to spread among the people at large some of the guiding principles of weather forecasting. It is very generally admitted that the forecasts and warnings of the Bureau find their fullest application to the varied interests of agriculture, commerce, and navigation among persons who have given the matter some study and who possess a rudimentary idea, at least, of the general principles of forecasting. The bulletin contains results that have been acquired by years of practical experience. Professor Bigelow treats the subject by months, beginning with August, when the atmospheric circulation is rather feeble and the eastward drift slow, passing gradually through the months of transition from hot to cold, finally reaching the winter months, whose characteristics are a boisterous circulation of the atmosphere, rapid eastward movement, and great alternations of temperature, pressure, etc.

The origin of storms in latitude and longitude, their progressive motion and general characteristics, are tersely set forth in this work.

Aerial work.—The results obtained with kites have been discussed in detail in a series of articles published in the Monthly Weather Review, Vol. XXIV.

In the work of the preceding year special attention was given to producing a kite that would fly at the highest possible angle of elevation consistent with a large angle of incidence; that is to say, if the

bridle of any kite is so set that its angle of incidence is, say 20°, then, if the action of this kite were absolutely perfect, upon a short string, it should fly at an angular elevation of 70°. Owing to the weight of the kite, the pressure of the wind upon the framework, and other causes, no actual kite could fly at so great an angle under such circumstances; but it was found possible, by means of certain improvements, to secure an approximation to the perfect kite in this respect, represented by a numerical efficiency of from 90 to 95 per cent. This efficiency has been calculated upon a mechanical basis similar to that employed in other branches of applied mechanics.

In the work of the current year, while still retaining the improvements brought out in the preceding year, attention was directed to securing an increased pulling power for a given kite, other things remaining the same. What may be regarded as a final solution of this element of the problem has not as yet been reached, but important improvements and discoveries have been made. Full details of these will be reserved for more extended presentation in a subsequent report. It will suffice for the present to say that an elevation of 7,500 feet has been reached by a single kite carrying over 2 pounds in instruments, and the entire supporting action was secured from 41 square feet of sustaining surface, yielding from 50 to 80 pounds pull on the line.

Complete safety and immunity from breaking the main line is one of the most important factors in kite flying. This is the more difficult to secure in proportion as the elevations aimed at are greater, for the reason that in such cases the strain upon the line must be increased until the margin of safety is comparatively small.

Two important improvements have been effected, both contributing to increase the safety of the operation of flying a kite.

The first of these consists of an improved method of bridling a kite, so that by securing a peculiar relation of the forces in action the pull upon the line tends to remain more nearly constant when great variations take place in the force of the wind. Only recently has it been possible to fully develop the mechanics of the action of the forces in this particular case, and it is now believed that by the aid of this knowledge we shall in the near future be able to secure a still more perfect automatic regulation of the pull than has thus far been realized in the kites now in use.

The second improvement, tending to increase the safety in kite flying, consists of what has been called the "safety line." This is a small piece of steel wire of the finest possible quality, inserted immediately between the end of the main line and the kite. If, for example, it is desired to protect the main line so that it shall not be strained to more than 90 pounds by the kite, then a "safety line" of such a size that it will be broken by a strain of 90 pounds is selected. This line is inserted in such a way that it carries all the pull of the kite, and if, by any circumstances, the strain exceeds 90 pounds, the "safety line" will break. The kite, however, does not escape, but is immediately held in restraint by means of a supplementary bridle that was previously a little slack, and which is fixed to the kite at such a point that when the kite is flying from the supplementary bridle the pull, other things being the same, will be much smaller than obtains with the normal bridle. In actual work it has been found that the pull falls from about 90 pounds to about 50 pounds when the safety line breaks. The kite, therefore, continues to fly in a very satisfactory

manner, and it is sometimes difficult to say certainly whether or not a safety line has broken until the kite is landed.

The general success attained in the experiments made prior to July 1, 1897, has justified a considerable extension of the work during the ensuing year, the preparations for which are now well under way.

Object of kite flying.—The object of perfecting an apparatus for more successfully flying kites is to secure meteorological observations at great altitudes above the surface of the earth. From a knowledge personally gained by many years' service as an official forecaster, I do not hesitate to express the opinion that we have reached the highest degree of accuracy in the making of forecasts and storm warnings possible to be obtained with surface readings only. It is patent that we are extremely ignorant of the mechanics of storms; of the operations of those vast yet subtle forces in free air which give inception to atmospheric disturbances and which supply the energies necessary to continue the same. It has, therefore, been the policy of the Bureau, during the last two years, to systematically attack the problem of upper air exploration, with the hope of ultimately being able to construct a daily synoptic weather chart from simultaneous readings taken in free air at an altitude of not less than 1 mile above the earth.

It is believed that the method adopted by European investigators of sending up observers in balloons, or of liberating free balloons with automatic instruments attached, will be of very limited use in acquiring a more perfect knowledge of the forces that work about a storm center. The plan previously proposed by the Bureau of making daily balloon ascensions from a given station would give results of slight benefit to the weather forecaster. The plan on which I have been working the last two years is to secure a simultaneous view, by means of automatic instruments displayed at the same moment of time from many stations and elevated to a height of at least 1 mile. It is believed that simultaneous observations at a high level from many given stations (if the kites can be perfected to such a degree as to render it possible to secure daily observations) will ultimately result in a better understanding of the mechanics of storms.

If the kite stations can be established and successfully operated day by day, we shall then construct a chart from the high-level readings obtained at many stations, and study the same in connection with the surface chart made at the same moment. Being thus able to map out the vertical gradients of temperature and pressure, as well as the horizontal distribution of these forces, on two levels, it is hoped to better understand the development of storms and cold waves, and eventually to improve the forecast of their coming, extent, and rate of movement. To be sure, the success of this investigation depends on perfecting the appliances for carrying the instruments to great elevations. Effort will be made to successfully establish about twenty kite stations during the present fiscal year. If these can be successfully operated, and if results are obtained which are useful to the forecaster, it is desired to continue them as a part of the Weather Bureau system; otherwise, they can be discontinued as soon as negative results are shown.

Cloud work.—The international simultaneous cloud observations referred to in my last report were concluded on June 30, 1897. About 7,000 observations for cloud heights and probably 2,000 pairs of observations for direction and velocity were obtained at the primary station in this city.

The plan for a system of simultaneous observations over the whole world on the height, direction of motion, and velocity of movement of clouds was set in operation May 1, 1896, in accordance with the suggestions of the international committee having charge of this work. The United States Weather Bureau has undertaken to contribute its share to this study of the circulation of the upper strata of the atmosphere over the Northern Hemisphere, and accordingly established a primary station at Washington, D. C., and fourteen secondary stations in various parts of the United States to carry out these observations. The cooperation of the authorities of the War Department in maintaining a base-line station on the War, State, and Navy building for the theodolite work required in these operations has been of invaluable assistance, because that site was the most favorable for the observations in connection with the telephone service.

At the nephoscope stations a very large number of readings for the relative motion of clouds have been made. Much of this latter work was done by volunteers, in the interests of this investigation, who realized the necessity of exploring our storm phenomena more thoroughly than heretofore. The Bureau has also collected on its charts during the past twenty-five years a series of cloud observations which are now to be drawn upon to provide fundamental data for this discussion. The "cloud year" ended for us on June 30, 1897, but some of the European observations will be continued longer, as there was delay in beginning the work at the time originally fixed.

The three classes of data mentioned—from the theodolites, the nephoscopes, and the Weather Bureau charts—now afford an opportunity, for the first time, to study our North American circulation carefully. The observations are being reduced as rapidly as possible, and the necessary theoretical studies are intrusted to Prof. Frank H. Bigelow, who is endeavoring to reach definite conclusions, based upon sound data, as to the true theory of hemispherical circulation and other matters related to the origin and propagation of our storms. Much labor is required to handle the material, but it is expected to have the report ready during the year 1898.

REPORT OF THE STATISTICIAN.

U. S. DEPARTMENT OF AGRICULTURE,
DIVISION OF STATISTICS,
Washington, D. C., October 1, 1897.

SIR: I have the honor to submit herewith a report of the work of the Division of Statistics for the fiscal year ending June 30, 1897, together with certain recommendations relative to the organization of the division and the scope of its work. My official connection with the division dating only from July 2, so much of the following statement as relates to the actual work of the division during the year mentioned has been taken from a report prepared for me by Mr. George K. Holmes, until recently chief of the Section of Crop Reporting and now Assistant Statistician.

Respectfully,

JOHN HYDE,
Statistician.

Hon. JAMES WILSON,
Secretary.

WORK OF THE YEAR.

The preparation of monthly reports concerning the condition, acreage, and production of certain products of the soil and the number and value of farm animals has been the principal work of this division during the year. These reports have been based on returns received from a corps of 56,700 regular correspondents, reporting monthly, and 140,500 special correspondents, reporting at particular seasons of the year.

REPORTS PRINTED.

In addition to the Monthly Crop Reports, the number of copies of which ranged during the year from 172,500 to 200,000 per month, special reports to the total number of 325,000 copies were also published.

A special report on The Number and Value of the Farm Animals of the United States and Animal Products, 1880 to 1896, presented the facts by States and Territories, and showed the percentage of increase or decrease, the average values, and the percentage of losses, with ratios to population. This report contained, also, an estimate of the number of farm animals in the world, by countries.

Circular No. 1 was prepared in response to numerous requests to show the acreage, production, and value of certain principal farm crops in the United States from 1866 to 1895, with other data as to cotton and wool. The wheat crop of the world from 1891 to 1895, by countries, was exhibited in Circular No. 2. Circular No. 3 was concerned with the farmers' interests with respect to the standard of value, and Circular No. 4 contained the final estimate of the cotton crop of 1895. The effect of an exclusive land tax upon the farmers'

finances was considered in Circular No. 5; the final estimates of the cereal crops of 1896 were contained in Circular No. 6, together with an estimate of the world's wheat crop of that year, and Circular No. 7 gave the preliminary estimate of the cotton crop of 1896. Two bulletins were issued, one relating to "Railway Charges for the Transportation of Wool" and the other to "Freight Charges for Ocean Transportation of the Products of Agriculture."

FOREIGN STATISTICS.

Statistics of foreign countries respecting the production, imports, and exports of agricultural staples have long formed a somewhat prominent feature of the publications of the division, and although the amount of such matter published during the last fiscal year was smaller than usual, the subject was not altogether neglected. Communications from the European agent of the Department appeared from month to month in the reports of the Statistician, and similar information was received from some of the United States consular and diplomatic representatives abroad through the courtesy of the Department of State.

RECOMMENDATIONS.

OBJECTIONS TO PRESENT SYSTEM.

Although my official connection with the Division of Statistics has existed only ninety days, it has been sufficient to impress me strongly (1) with the extreme cumbrousness of the existing system of crop reporting, (2) with the fact that the information obtained is utterly incommensurate with the labor involved in its collection, and (3) with the disadvantage under which the farmer labors in being placed in possession, so much less promptly than other citizens, of the information which the Department makes public from time to time concerning the condition of the crops in this and other countries.

CUMBROUSNESS OF EXISTING METHODS.

Eleven times during each year 7,500 persons report on the condition of the crops in their respective localities to 21 salaried State agents, who coordinate their reports and communicate the results—with the *State* as the geographical unit—to the Department at Washington. At the same time that this is being done, 6,800 other persons are reporting to 2,400 county correspondents, who similarly coordinate their returns and report to the Department, with the *county* as the geographical unit. The same mails that bring these State and county reports to Washington carry also similar reports from 40,000 correspondents who report each for his own township, beat, magisterial district, or voting precinct, and several times during the year the number is still further increased by the addition of 12,500 cotton correspondents, 15,000 millers, elevator proprietors and grain dealers, and a variable number of individual farmers, selected from a list of 113,000, there being thus a by [illegible] possibility that nearly 200,000 persons may report [illegible] upon the condition of certain selected crops. In addi- [illegible] those 115 transportation companies make monthly returns of [illegible] of cotton shipped over their respective lines, with the [illegible] of [illegible] and destination. The individual reports received from [illegible] various agencies aggregate a number so large as to have [illegible] during 1896 [illegible] reports each covering from ten to forty

questions, for each person employed upon their tabulation in Washington, a number the full significance of which becomes apparent only when it is remembered that the work has to be performed very largely between the 1st and 10th days of each month.

WHERE THE SYSTEM IS WEAK.

It would naturally be supposed that with so elaborate an organization—a force outnumbering the enumerators of the Federal census 5 to 1—the most complete and accurate setting forth of the agricultural condition of the country that can be arrived at by any means short of an actual farm-to-farm canvass would at all times be within the power of the statistician. As a matter of fact, however, this highly elaborate system is in several important respects exceedingly weak. The indefinite multiplication of crop reporters, whose only compensation is an occasional bulletin or a few packets of garden seed, unquestionably weakens the sense of responsibility on the part of the individual reporter and impairs that obligation to the faithful performance of duty which should accompany even the rendering of gratuitous service. Resignations, necessitating new appointments, average about 100 per day, all the year round; cases of indifference and neglect are unfortunately not less frequent.

Furthermore, the handling of so enormous a number of returns within the few days preceding the 10th day of each month precludes that careful coordination of facts, that reconciliation of conflicting testimony, and that confidence in the final results arrived at which should characterize an ideal or even a reasonably satisfactory system. It is rarely that agricultural products are reported upon to the Department in units of quantity. In the main, the Department's method is one of comparative percentages, with the figures of the decennial census as a starting point. In the interval between two censuses, therefore, a cumulative error of only 2 per cent per annum would amount to one-fifth of the total production. A cumulative error of 5 per cent per annum would produce the same result in four years; and if this possible departure from actual conditions is somewhat in excess of any that is known to have occurred, it is to the credit of my predecessors rather than to that of the system itself.

A SELECT CORPS OF PAID CORRESPONDENTS.

But unwieldy as is the machinery employed, I should recommend its dismemberment only in the event of provision being made for some slight pecuniary acknowledgment of the services of a carefully selected corps of correspondents, located mainly in the principal agricultural States. So marked is the geographical concentration of agricultural production in the United States that 25 States, or just half the total number, produce 98 per cent of the cotton, 95 per cent of the corn, 95 per cent of the barley, 93 per cent of the oats, and from eight-tenths to nine-tenths of the wheat, rye, buckwheat, tobacco, potatoes, and hay produced in the entire country.

By the judicious selection, therefore, in not more than twenty-five States of a corps of intelligent and, if possible, experienced correspondents, each of whom should be paid $2 for each of nine reports and $1 for each of two reports, making $20 per annum, the Department would establish a system upon which it could rely for the due reporting of all but a very small part of the total production of the principal crops, and it could safely depend upon its salaried State agents

for information concerning the minor agricultural States. I estimate the cost of such a system at not to exceed $30,000 per annum, and respectfully recommend that Congress be asked to make the necessary appropriation.

TRAVELING INSPECTORS.

As a further means not only of strengthening and unifying the statistical work of the Department, but also of bringing the Department itself into closer touch with the agricultural interests of the country, I recommend the appointment of five traveling inspectors, whose duties, somewhat analogous to those of the inspecteurs d'agriculture of the French Government, shall include the periodic visitation of the State agents and county correspondents for the purpose of insuring a proper understanding on the part of those persons of the duties required of them and of securing absolute uniformity of method in considering and reporting upon the condition of crops; the submission of reports based on the inspectors' own observations at critical periods or in special localities; the careful watching out for those sudden developments or insidious changes in the agricultural conditions of particular sections of the country which frequently have far-reaching economic results before their importance, if not their existence, comes to be fairly appreciated, and various other functions with which such officers might advantageously be intrusted in connection with the work of this great Department.

American agriculture, with its field of operations extending from the subarctic to the subtropic, representing a capital of sixteen thousand million dollars and constituting the direct source of subsistence for twenty-five millions of people, or nearly 40 per cent of the entire population of the country, is an industry of vast extent and exceeding complexity, and I know of no plan by which the Department can more readily keep itself informed as to its ever-changing conditions and growing needs than would be afforded by the employment of a properly equipped traveling officer in each of the five great groups of States into which the country may conveniently be divided, viz: the Atlantic, Pacific, Central, Southern, and Trans-Mississippi. For the salaries, transportation, and subsistence of such officers I estimate there would be required not to exceed $20,000 per annum.

QUALIFICATIONS OF STATE AGENTS.

The Department's increased dependence upon the State agents renders it doubly important that these officers should possess all the qualifications necessary to the proper performance of the duties required of them. The existing system of State grouping is very unsatisfactory, and I respectfully recommend the appointment of a statistical agent in each State, as was the practice of the Department [illegible] a thorough acquaintance with the agricul- [illegible] abilities of his State should be required of [illegible] ledge constitutes by no means the only [illegible] possible for a State agent to depend [illegible] stigations in reporting the con- [illegible] eports rendered absolutely [illegible] form the simple oper- [illegible] average. Still, the value [illegible] depends very largely upon his [illegible] State, and the educational test to which he [illegible] should be of the most practical char-

acter. I strongly recommend that every new appointment be made for a probationary period of six months, in order that the qualifications of the appointee may be put to a practical test before he receives a permanent appointment.

MISDIRECTED ENERGY.

With respect to the investigations carried on by this division in the past, there has unquestionably been a considerable misdirection of energy, and consequent waste of public money. As an illustration of this, it may be mentioned that although three-fourths of the annual buckwheat crop of the country is produced in three States and one-half of the remainder in three others, 50,000 correspondents scattered throughout the country have been called upon five times in each year to report upon the condition of whatever insignificant contribution might be made by their respective localities to the remaining small fraction of this comparatively unimportant crop; and this when wool was receiving only the most scanty and perfunctory attention and the great dairy industry of the country was entirely ignored. Similarly, timothy and clover have been separately reported upon from time to time in percentages of a full normal crop, when the Department was not in possession of any standard with which such reports could be compared, and when, too, not the slightest attempt was being made to ascertain the production of sugar or rice, or to obtain information relative to the viticultural, the truck, or other important industries that claim a share of the Department's attention.

CROP CONDITIONS OF COMPETING COUNTRIES.

But while the statistical investigation of our own domestic agriculture should be made much more complete than in the past, increased attention should also be given to the crop conditions of other countries, especially of those which compete with the United States in the markets of the world. The creation of special agencies for this purpose, outside of the Division of Statistics, can never relieve the Statistician of the obligation resting upon him to keep himself informed, by agencies under his own immediate supervision, of the ever-varying conditions of foreign agriculture and foreign markets.

EXTENSION OF INFORMATION TO THE FARMER.

Lastly, the important question presents itself, How may the American farmer be made to receive greater benefit from the collection of information designed primarily for his use? Hitherto a summary of the Monthly Crop Report has been telegraphed to the principal cities on the 10th day of each month, and between the 15th and the 25th a printed report has been mailed to about 200,000 persons, mainly farmers. During the last ninety days the printing and mailing of this report have been considerably expedited, and I hope to still further accelerate the publication of the report in printed form in the near future, so that its mailing shall begin within twenty-four hours of the transmission of the telegraphic summary. Even then, however, the Department will fall far short of doing its full duty to the farmer as regards the information in its possession as to the condition of the crops at home and abroad and the actual and prospective state of the markets. I believe the needs of the farmer in this regard would be largely met by the prominent display in rural post-offices of brief reports on the condition of the staple crops, on the prices ruling in the

principal markets, and on the prospective requirements of foreign countries. This could be done ten times in each year (preferably during the usual marketing season) at a cost not to exceed $1,000 per annum.

REORGANIZATION AS A BUREAU.

In conclusion, I desire to express my conviction that the work of the division would be much more effectively performed if the division had the advantage of a bureau organization. The largest permanent office of the Government engaged in statistical work, it stands almost alone in having merely a divisional organization. The Bureau of Statistics of the Treasury Department employs only 36 persons and has an appropriation for the present year of only $49,850. The Bureau of Foreign Commerce (until recently the Bureau of Statistics) in the State Department is one of six bureaus that altogether employ only 82 persons, at a total estimated expense for the present year of $135,220. The Bureau of Immigration employs but 9 persons, at an estimated cost of $10,560. The Office of the Comptroller of the Currency in the Treasury Department employs 90 persons, at an estimated expenditure during 1897–98 of $121,840, while even the Department of Labor has only 92 employees, though having the somewhat larger appropriation of $180,490. The Division of Statistics in the Department of Agriculture, with an appropriation for the present year of $145,160, has 127 salaried employees and a voluntary field force of nearly 200,000 persons, extending to the most remote sections of the country. Of its various publications during the year 1896 there were distributed 2,322,000 copies, and in addition to its immense ordinary correspondence, about 7,000 letters were written in response to requests for special statistical information that could not be supplied in printed form.

ADVANTAGES OF BUREAU ORGANIZATION.

Whether the crop-reporting agencies of the division continue on their present basis, or the recommendations I have respectfully submitted should be favorably acted upon, in either event there will be a very large amount of administrative detail that can be most advantageously separated from the statistical work proper. This, if the division were made a bureau, would devolve largely upon its chief clerk, who would have general oversight of the employees and of all matters relative to supplies, disbursements, etc., that usually come within the province of such an officer. The divisions, the establishment of which I would recommend for a commencement, would be three in number—the first, to be known as the crop-reporting division, being charged with the tabulation of the returns received from time to time from the regular crop correspondents and with the preparation of the material for the monthly reports; the second, to be known as the foreign division, to collect and coordinate the most complete and reliable information possible as to the condition of the crops of other countries and the prospective demands upon the exporting capacity of the United States; and the third, to be known as the division of special investigations, to conduct the numerous statistical investigations which can not be made through the agency of the regular crop reporters.

I estimate the additional expense that would be involved in this organization at not to exceed $3,000 per annum, the greater portion of which amount would be saved in other directions.

REPORT OF THE APPOINTMENT CLERK.

U. S. DEPARTMENT OF AGRICULTURE,
OFFICE OF THE SECRETARY,
Washington, D. C., November 6, 1897.

SIR: I have the honor to submit herewith a report upon the number, aggregate salaries, and legal residence of the officers and employees of the Department of Agriculture stationed in Washington, D. C., and also of the entire body of officers and employees of the Department of Agriculture, wherever stationed, on July 1, 1897.

Very respectfully,

J. B. BENNETT,
Appointment Clerk.

Hon. JAMES WILSON, *Secretary.*

The following tables show the number of persons accredited to each State and Territory employed in the Department of Agriculture, the aggregate amounts of salaries received, and the per capita of same:

Statement showing the number of officers and employees in the Department of Agriculture (including the Weather Bureau and the Bureau of Animal Industry) stationed in Washington, D. C., the State or Territory from which appointed, and the aggregate of their salaries or compensation, on July 1, 1897.

Whence appointed.	Number.	Aggregate salaries.	Whence appointed.	Number.	Aggregate salaries.
Alabama	5	$5,160	Nebraska	17	$18,400
Arkansas	3	3,800	New Hampshire	4	4,000
California	7	8,500	New Jersey	14	17,380
Colorado	3	2,320	New Mexico	2	2,400
Connecticut	4	9,500	New York	51	60,860
Delaware	2	2,800	North Carolina	17	19,090
District of Columbia	165	141,260	North Dakota	1	720
Georgia	4	4,200	Ohio	30	35,880
Illinois	26	33,040	Oregon	1	1,200
Indiana	13	17,440	Pennsylvania	46	52,250
Iowa	21	30,480	Rhode Island	4	3,440
Kansas	14	18,000	South Carolina	4	3,440
Kentucky	11	10,880	South Dakota	5	4,540
Louisiana	1	1,000	Tennessee	13	15,920
Maine	5	5,400	Texas	2	2,200
Maryland	43	44,540	Utah	1	1,800
Massachusetts	23	33,070	Vermont	2	2,900
Michigan	32	37,870	Virginia	65	60,590
Minnesota	12	13,580	West Virginia	10	8,500
Mississippi	3	2,420	Wisconsin	10	11,970
Missouri	16	19,920			
Montana	3	3,800	Total	715	776,600

Statement showing the entire number of officers and employees in the Department of Agriculture appointed from each State and Territory and the District of Columbia, wherever stationed, and the aggregate amount of their salaries or compensation on July 1, 1897.

Whence appointed.	Aggregate number.	Aggregate compensation.	Per capita.	Whence appointed.	Aggregate number.	Aggregate compensation.	Per capita.
Alabama	38	$12,512	$329.26	Nevada	2	$2,400	$1,200.00
Arkansas	26	13,722	527.76	New Hampshire	9	8,450	938.88
Arizona	3	2,400	800.00	New Jersey	37	40,595	1,097.16
California	44	43,780	995.00	New Mexico	6	7,040	1,173.33
Colorado	11	10,680	970.90	New York	150	151,918	1,012.78
Connecticut	20	21,547	1,077.35	North Carolina	52	31,909	613.63
Delaware	8	6,460	807.50	North Dakota	12	2,554	212.83
District of Columbia	173	148,900	858.38	Ohio	106	81,019	764.41
Florida	27	11,044	409.03	Oregon	16	11,340	708.75
Georgia	48	11,956	249.08	Oklahoma	1	840	840.00
Idaho	2	2,700	1,350.00	Pennsylvania	113	100,066	885.53
Illinois	278	219,770	790.00	Rhode Island	12	7,660	638.33
Indiana	79	59,508	753.27	South Carolina	38	7,298	192.05
Indian Territory	2	72	36.00	South Dakota	14	15,620	1,115.71
Iowa	81	76,946	949.95	Tennessee	43	30,804	716.30
Kansas	71	62,319	877.73	Texas	43	15,405	308.13
Kentucky	47	24,124	513.27	Utah	3	4,100	1,366.66
Louisiana	30	8,684	289.46	Vermont	7	8,900	1,271.42
Maine	21	22,540	1,073.33	Virginia	86	73,489	854.52
Maryland	75	70,396	938.61	Washington	10	7,580	758.00
Massachusetts	99	81,644	824.67	West Virginia	26	15,256	586.76
Michigan	101	69,610	689.20	Wisconsin	69	47,448	687.65
Minnesota	43	18,536	431.07	Wyoming	2	3,000	1,500.00
Mississippi	32	7,397	231.15	Foreign	3	1,350	450.00
Missouri	113	89,716	793.06				
Montana	7	7,120	1,017.14	Total	2,443	1,868,180	.....
Nebraska	104	88,056	846.69				

General average, $764.70 per capita.